





PRODUCTIVE USES OF RENEWABLE ENERGY IN GUATEMALA – PURE

PIMS No. 3186 (ATLAS Proposal N.00043790-ProjectN. 00051216)

TERMINAL EVALUATION

FINAL REPORT (Version 3.3) (With upheld observations)

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Final Term Evaluation:

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ACRONYMS

AGER	Association of Rural Entrepreneurs
AGEXPORT	Association of Exporters
ANACAFE	National Coffee Association
APR-PIR	Annual Project Report – Project Implementation Review
BANRURAL	Rural Development Bank
CNEE	National Commission on Electricity
СО	Country Office (UNDP)
COCODES	Community Development Council
COMODES	Municipal Development Council
CONAP	National Commission of Protected Areas
DGE	Directorate General for Energy
ESMAP	Energy Sector Management Program
FCG	Guatemalan Trust Fund for the Environment
FOGUAMA	National Fund for the Environment
FONACON	National Fund for Conservation
FONAPAZ	National Trust Fund for Peace
FUNCAFE	Foundation for Coffee Development
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GoG	Government of Guatemala
GVEP	Global Village Energy Partnership
IADB	Inter-American Development Bank
INAB	National Institute of Forestry
INDE	National Institute for Electrification
INFOM	National Institute of Municipal Development
IW	Inception Workshop
M&E	Monitoring and Evaluation
MAGA	Ministry of Agriculture, Livestock and Food
MARN	Ministry of Environment and Natural Resources
MDO	Millennium Development Objectives
MEM	Ministry of Energy and Mines
MHP	Mini/Micro Hydropower
MSP	Medium-Sized Project (GEF)
MTE	Mid Term Evaluation
OLADE	Latin American Organization for Energy
PER	Rural Electrification Program
PF	Pre-Feasibility

PRODOC	Documento de proyecto TPR
PUE	Productive Uses of Energy
PURE	Productive Uses of Renewable Energy
PV	Photovoltaic
RCU	Regional Coordinating Unit (UNDP-GEF)
RE	Renewable Energy
REDPPER	National Association of Renewable Energy Producers
RET	Renewable Energy Technology
SEGEPLAN	Secretariat of Planning and Programming
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
URL	Rafael Landívar University
US\$	United States Dollars
VAT	Value-added Tax
WB	World Bank
Wp	Watt peak

CURRENCY

National currency:	Quetzal	Symbol: Q
Exchange rate (on No	ovember 2012)	1 US\$ =7.8 Q

UNITS

kWh	kilowatt hour
kW	kilowatt
MW	megawatt
Mt	million tons
t	metric ton
Wp	Peak Watt
t Wp	metric ton Peak Watt

0. EXECUTIVE SUMMARY

The Project *Productive Uses of Renewable Energy in Guatemala* – (*PURE*) - UNDP-GEF **PROJECT** (*Project PIMS No. 3186*) *is a Project* executed by the Fundación Solar (FUNSOLAR), on behalf of the Government of Guatemala, with implementation support by UNDP.

The project aims at the introduction of renewable energy technologies (RETs) for production processes that lead to an improvement in the living conditions of the inhabitants of rural areas in Alta Verapaz, Baja Verapaz, Quiché, Huehuetenango and San Marcos, of predominant Mayan descent, socioeconomically characterized by a high degree of poverty, low income, low productivity, expensive supply of commercial energy and heavy reliance on traditional fuels such as firewood. Furthermore, these rural areas have water resources and other renewable energies that allowed for the consideration of developing Mini Hydroelectric Plants (MHP) as an alternative for decentralized energy supply, alternative to the costly electrical grid extension in rural areas and the development of generation projects connected to the power grid. These projects would be an investment opportunity for the private sector and require conservation of watersheds to ensure the sustainability of hydropower resource.

The background of the project indicate that the project *is relevant for the living conditions of rural population in Guatemala*, it is *in line with GEF objectives* and goals guiding the country both towards the attainment of Millennium Development Goals and towards a low-carbon economy. *Guatemala was also a nation eligible* for GEF projects. In accordance with its environmental policy, *Guatemala ratified* the United Nations Framework Convention on Climate Change (UNFCCC) on March 28, 1995.

The global environmental objective (project goal) was to reduce greenhouse gas emissions (GHG) from Guatemala by promoting productive uses of renewable energy, with strong rural development benefits. Application of PURE would result in a direct reduction of emissions equivalent to 1.75 Mt (million tons) of CO_2 , and indirect reduction to 5.25 Mt CO_2 equivalent, over a project life of more than 20 years, by replacing the current and planned use of fossil fuels by renewable energies.

In the formulation of the project, a number of different kinds of barriers hindering the development of RET were identified, which were classified according to the RET connection to the network (connected or off-grid) and the different types of energy services and financing providers. These barriers are of legal and regulatory type, of adequate participation and benefits for regions where people develop these projects, lack of technical capacity in RET, lack of experience and skills in managing the social complexity for the development of these projects. The project strategy designed products aimed to remove each one of these of barrier categories.

The PURE aims to remove barriers to the adoption of RET, mainly with MHP, by promoting productive uses of energy in these areas, recognized as one of the poorest areas in Guatemala. The sustainability of productive uses would be strengthened through the application of adaptive mechanisms that addressed the management of natural resources and vulnerability problems where projects were developed, providing the necessary structural support for the formulation of policies and relevant regulations, and by supporting national and local dialogue between multiple stakeholders for long-term collaboration.

The Project Document (PRODOC) in its final version (July 17, 2007) provides for the implementation of a Full Size Project, with the following four results:

- 1. Development and promotion of 1.5 MW in technologies for Productive Use of Energy (PUE) off the grid
- 2. Development of 13.5 MW of energy and promoting RET connected to the grid (MHP)
- 3. Sustainable management of natural resources and energy in river basins
- 4. Establishment of conditions for replication of the project (including political and regulatory proposals); monitoring, learning and assessment

Project implementation began on August 6, 2007, with an initial term of four years (until September 30, 2011). The implementation period was extended twice: The first time for a year and three months (until December 31, 2012) mainly due to delays in implementation, resulting from the interdependence of the components in the actual execution of the project and that they were not properly considered in the formulation of PRODOC¹, and delays that arose either from institutional adjustments in FUNSOLAR in 2010 and adjustments that emerged during the substantive review of the project in 2011.

The substantive review of March 31, 2011 responded to the need of reconsidering the overambitious scope of results 1 and 2 versus the resources involved in the project and its execution time, resulting in a review and adjustment of the goals of the project indicators. The final-term evaluator recommended a third extension of the implementation period, in order to close the project and it runs until March 31, 2013.

The UNDP as the implementing agency has managed the project in accordance with administrative regulations and procedures, also complying with functions established in the PRODOC.

As executing agency, the FUNSOLAR NGO would be responsible for the supervision of the general aspects of the project and for the design, management and monitoring of the project components, the approval of each of its activities and specific terms of reference, hiring professional staff, service personnel and equipment, to report on project development and payment orders. The institutional crisis faced by FUNSOLAR in 2009-2010 put at serious risk the project because it lost numerous and qualified experts, and led to delays in implementation. FUNSOLAR overcame that crisis well and the project could continue.

To implement the project, a Project Steering Committee composed by different state organizations (Ministries of Energy and Mines, Environment and Natural Resources, Agriculture, Livestock and Food, and others involved in the social and economic development of the nation) was constituted. Its functions were interagency coordination and identification of synergies between the different actors of the project.

A Project Management Unit was also established composed of a Project Coordinator together with other project staff. An International Technical Advisor was included to accompany the project during implementation in the various aspects concerning the project.

¹ For example, it is not possible to advance productive use projects until works of installing the generation systems have actually started.

The project established an extraordinarily detailed initial schedule of activities to be performed for each result, which was adapted on the course of implementation.

The PRODOC logical framework matrix established performance and impact indicators for project implementation (42) and for different times in its execution (project baseline, mid-term and final), with sources of verification. These indicators and sources of verification are the basis of the monitoring and evaluation that have been employed by the UNDP and FUNSOLAR and, the mid-term evaluator. Following the project's substantive review 22 indicators were established focusing not only on implementation but also on RET projects identification. These are the indicators used in this assessment.

The value of the project was US\$ 14.05 million with a GEF contribution of US\$ 2.55 million and co-financing by the government of Guatemala of US\$ 9.325 million, private investment of US\$ 1,000,000, US\$ 1,000,000 from other sources and US\$ 175,000 in kind by FUNSOLAR.

This terminal evaluation is intended to determine the relevance, performance and success of the project, looking for signs of potential impact and sustainability of results, including the project's contribution to capacity building and the achievement of global environmental goals. It also intends to identify and document lessons learned and make recommendations that might improve design and implementation of other UNDP-supported GEF-financed projects. The main results and findings² of the terminal evaluation are as follows:

Project Formulation

For the formulation of the project, a good characterization of the social and economic situation of rural communities targeted by the project was made; of the limitations of rural electrification programs for the supply of electric power; of the possibilities of using RET for productive use and of the results proposed to remove the identified barriers. All these elements are well intertwined in the concept of the project, which is in line with national policies and commitments in the path towards sustainable development and social equity.

The four results of the project and its components follow a coherent logical framework to remove barriers and to achieve the attainment of the objectives. In this logical framework, indicators for each outcome, targets to be achieved and, means of verification and assumptions critical to achieving the goals were also made.

Therefore, it is considered that the PRODOC contains the necessary elements for the implementation and execution of the project. However, the following shortcomings in estimation, design and programming are found in its formulation:

• The goals of results 1 and 2 are extremely ambitious seeking to develop 1.5 MW in off-grid systems and 13.5 MW with grid interconnected systems, and the execution time of 4 years is short. These goals were not achieved although 451 kW were indeed produced with three, off-grid MHP donated by Japan, as discussed below.

² The methodology included review of documents received from the parties, interviews with them and other stakeholders, field visits and presentation of preliminary results to the parties

• This led to a substantive review of the project that assessed the indicators and goals. According to this review, we should consider hydropower of the projects implemented those currently in execution and those identified, as discussed below.

Monitoring, follow-up and evaluation mechanisms were established by UNDP in these projects and have been satisfactorily met.

Project risk analysis considered a variety of risks, which were deemed minor, but two risks crucial for the project were not considered:

- The risk that resources by the GoG were not provided in the amount and timing required, as well as those coming from private sector associations. GoG resources were committed by the institutions through letters of intent, which ensured no contributions and were not paid, though later GoG institutions contributed to the co-financing of PURE but not in the initial amount and opportunity.
- A second risk not considered, and which should be taken into account in future GEF projects, is that an implementing NGO agency may suffer internal instabilities that lead to project failure.

The evaluator considers that the conceptualization/design of the Project is *Moderately Satisfactory* (*MS*).

Project Implementation

The implementation strategy of the project is considered successful because FUNSOLAR participation and its relationship with the institutions of the GoG through the Steering Committee, was the appropriate institutional framework for implementation. FUNSOLAR is an NGO that received the top qualifications in the evaluation "Monitoring the Capacity of Fundación Solar" made for PRODOC³. However, it overestimated its summoning and institutional power of mobilization before government agencies, where changes resulted in a high rotation of Steering Committee members.

The Logical Framework was the conducting axis during the implementation of the initiative. The project had a Mid Term Evaluation, which identified the difficulties in project implementation arising from the ambitious goals 1 and 2.

The work plan presented in the PRODOC was adjusted periodically to meet project implementation. These plans were presented to, and approved by UNDP-GEF. The project established from the beginning the terms of reference (ToR) of the contracts required for implementation. Regarding consulting firms and consultants, these satisfactorily complied with the quality of the deliverables and deadlines.

The interrelationship between the UNDP and FUNSOLAR was swift and smooth. Overall bilateral communication channels between the two parties were satisfactory, and there was no evidence to the contrary.

The evaluator considers that the implementation approach is Satisfactory (S).

³ PRODOC, Annex G.

Monitoring and Evaluation

From a review of the information received, it was possible to infer the following compliance of the monitoring mechanisms:

- FUNSOLAR as project implementing agency has dealt with the daily tasks using quarterly and annual operating plans (AOP).
- Regarding monitoring mechanisms, this project prepared all PIR / APR (PIR: UNDP Project Implementation Reports and APR: UNDP Annual Project Report) (2008-2012).
- While in 2007-2008 the qualifiers are on average Satisfactory, in later reports 2008-2009 and 2009-2010, both objective achievement and project implementation assessments are between MS and MU⁴, indicating difficulties in project implementation (low execution was further affected by changes in FUNSOLAR). The need for a substantive review of the project was identified in the PIR 2009-2010 and was carried out on March 31, 2011. Already in the PIR / APR of 2010-2011 and 2011-2012 there is improvement shown in development goals that went up to MS and S for project implementation.
- Project performance has been globally rated in the past two PIR as MS and S for development goals and MS in both periods for the implementation of the project.
- It should be noted that after FUNSOLAR restructuring, activities increased and allowed to reach in the past two years most of the project's achievements.
- <u>Standard Progress Reports</u>. They consist of the APR / PIR, Quarterly Operating Reports (QORs) and others indicated in the project's M&E framework. There are also final reports or products of subcontracts performed by consultants and consulting firms.
- <u>Project Final Report</u>. The Project Final Report has not been presented (as of December 2012)
- <u>Meetings of the Project Steering Committee</u>. Six meetings proceedings records were received corresponding to meetings since late 2009 to September 26, 2012, but none before 2009. They presented the status of the project and its development, and recommends actions to redirect its course.

The evaluator considers that a systematic following to the progress of the activities was given, and considers therefore that the monitoring and follow up of the Project is *Satisfactory* (*S*).

Replicability

PURE has produced an important legacy of different kinds of information such as diagnoses in communities on productive uses, training methodologies, the methodology called "PURE Working Model", good practice manuals, systematization of lessons learned, etc. All this information is found mainly in FUNSOLAR and should be made accessible to other actors in Guatemala. The Mid Term evaluator recommended in his time the diffusion of the material on the website of FUNSOLAR.

PURE has shown that off-grid projects MHP have quite high costs (especially those implemented by JICA) in such a way that to increase electricity coverage in rural areas has economic difficulties and questions the replicability of this technology. The replicability of efficient stoves and biogas plants projects as RET is evident; especially if one considers that the work of PURE is a very solid base for the replication of such projects in Guatemala.

⁴ Highly Satisfactory (HS), Satisfactory (S), Moderately Satisfactory (MS), Moderately Unsatisfactory (MU), Unsatisfactory (U) and Highly Unsatisfactory (HU).

Project Finance / Co-finance

Of the initial resources foreseen for the project, US\$ 14.05 million, the project has executed US\$ 2,514,162 of GEF resources (expected: US\$ 2,550,000).

FUNSOLAR has been very active in seeking resources again with the GoG and other international organizations and agencies. These resources have reached to date US\$ 19,538,709 of which the largest contribution corresponds to other agencies and foundations with US\$ 17,096,785 of which US\$ 15,175,000 corresponds to the execution of the agency JICA, and resources of the GoG for US\$ 2,266,924.

With regard to the relationship between the GEF contribution and the amount of resources mobilized, the project has had a high leverage factor of 8.7, which shows the project's efficiency in resource mobilization.

Cost-Effectiveness of the project

If 100% of the targeted 1.75 million t CO_2 avoided goal had been reached, the cost to the GEF would have been US\$ 1.45 / t CO_2 . But since only a reduction of 13% has been achieved to date, the cost is US\$ 11.09 / t CO_2 avoided. Now if we consider the possibility that in five years 50% of projects with prefeasibility were to be implemented, and efficient stoves and biogas plants introduced massively, the cost to the GEF would be US\$ 1.65 / t CO_2 avoided. This scenario is an optimistic one considering the future prospect of FUNSOLAR activities in its commitment to the rural sector.

According to the results, the efficiency of the project is considered *Moderately Satisfactory (MS)*

Sustainability

Four factors ensure the sustainability of project results. The first is capacity building. All results from PURE helped to develop capacity building. The beneficiaries, regional and national staff authorities, engineers, consultants, among others, received capacity building at different levels. Technical and project management capacities have been primarily transferred onto FUNSOLAR staff, beneficiaries and to a lesser extent, to other actors associated with PURE. The capacity developed will be used for sure by FUNSOLAR in the continuity of their projects, supported by other agencies and institutions, which will benefit the development of rural communities.

The second factor that ensures the sustainability of the project is the appropriation of RET. In the implemented projects, for example in MHPs in operation, biogas plants (biodigesters), improved stoves, watershed conservation projects and microenterprises, users have found the benefits of the RET and constitute demonstrative cases for these technologies. Similarly, social organizations, local authorities and community development organizations, have found these RET projects to prove their benefits, becoming promotional examples for these technologies.

The third factor is the development of institutional capacity mainly in FUNSOLAR. Future use of this capacity will depend on the activities undertaken for new projects in the rural sector.

The fourth factor should be a broad acceptance of RET technology among various institutional stakeholders by proven project results which allows acceptance of RET technology as an alternative for rural areas development. The evaluator considers from the interviews conducted with officials that there is no clear evidence of this acceptance.

For the financial sustainability of the implemented projects, there are two categories of projects implemented to consider: Projects with biogas and improved stoves that have the acceptance of the beneficiaries and the results have been so positive that sustainability is not questionable. By contrast, projects with off-grid MHP showcase the difficulty that productive uses have not been implemented, and energy demand is at very low levels, waiting to increase it in order to augment income. And to make sustainable electrical microenterprises and also raise funds to ensure the costs of preventive and corrective maintenance, it is urgent to ensure the sustainability of these MHP.

Therefore it is considered that while there are positive factors for the sustainability of the results of PURE, other factors such as a limited acceptance basis of the technology and the financial sustainability of off-grid MHP jeopardize the sustainability of various projects.

Considering the observed executed productive uses projects, with on and off grid electric energy, they face high challenges to assure financial sustainability. It is considered then, that the projects sustainability is *Moderately Likely (ML)*.

Impacts

It is advisable to keep in mind that the impacts at global environmental level would be visible in the emissions reduced by the project by the behavioral change of beneficiaries in the conservation of watersheds and the adoption of practices and technologies that reduce carbon emissions. While reduced emissions are minimal with respect to the goals, the changes that have occurred among rural beneficiaries are significant.

Outcomes of the Project

<u>Global Objective</u>. Reduction of direct emissions due to the use of MHP as Diesel replacement <u>Final Goal</u>: Reduction of 1.75 Mt of CO_2 emissions after 20 years. There are 8 indicators for the global objective⁵.

Achievements:

- The emissions avoided by the project and for the next 20 years (indicator 1) were estimated according to the degree of project development:
 - Projects implemented: 229,936 tCO₂/yr (13% of the goal)
 - Projects with prefeasibility: $2,622,875 \text{ tCO}_2/\text{yr}$ (150% of the goal)
 - \circ Projects identified: 6,188,713 tCO₂/yr (353% of the goal).
- The evaluation of the project considered emissions reduction by efficient stoves, a technology that had not been considered in the overall objective indicator and that has been successful. On a smaller scale, the use of biogas plants was also considered.
- In reference to the installed power (indicator 2), see Result 1.
- Avoided indirect emissions correspond exactly to 4 times avoided direct emissions. Considering that emission reductions will achieve in 20 years 230,000 t CO₂ with projects to be implemented, indirect emissions will reach 930,000 t CO₂.
- Productive use projects with agricultural products and electricity (indicator 4), which had the greatest impact, were not implemented because the 3 MHP built went into operation at the end of the project. Ecotourism projects and poultry production with biogas, food

⁵ Given the extension of the description of results, indicators, initial and post substantial review goals, the reader is invited to consult the complete version of the report.

processing with saving stoves and cellphone battery charging with solar energy were indeed found.

- There was no documentation of income growth and equitable distribution of income between men and women (indicator 5)
- The Project Steering Committee (or PSC) prepared its manual and held two meetings in 2008, one in 2009 and another in 2010. A substantive review (March 2011) considered necessary its reactivation which occurred during the last two years (indicator 6).
- There is no record of the number of PURE presentations and of the audiences for which they were made (indicator 7), but it is known that FUNSOLAR has been very active in this area.
- The PURE made numerous strategic alliances and agreements (indicator 8), with user associations, municipal governments, international and national agencies and institutions.
- Given the results achieved and the prospect of future development in a five year horizon, with the implementation of half of the projects with prefeasibility studies and if programs for the continued use of saving stoves and biogas plants, 88% of the goal target would be reached. If this were to happen, the fulfillment of the overall objective would be regarded as *Moderately Satisfactory (MS)*.

<u>Outcome 1.</u> Development and promotion of 1.5 MW off-grid RETs (micro hydropower) for productive uses

There are 5 indicators for the Outcome.

Achievements:

- In relation with the development of 1,500 kW of MHP (indicator 9) and solar systems :
 - A total of 16 projects (in San Marcos, Baja Verapaz, Huehuetenango and Quiché) with a capacity of 25,120.5 kW were identified,
 - o 7 projects at prefeasibility level with 1,543 kW were developed, and
 - 4 MHP with a capacity of 416 kW and, other solar energy projects and pico-hydro power plants, for a total of 417.62 kW, were implemented.
- The total value of the investments of the four MHP reached the sum of \$ 9,451,401 of which US\$ 8,563,901 corresponds to the contribution of JICA. The total installed power is 342 kW and the average cost ranges from US\$ 6,339 / kW for Yalambojoch MHP (a prefeasibility level) and US\$ 34,676 / kW for Las Conchas MHP (implemented). The plants built by JICA are state of the art but cost an average of US\$ 29,318 /kW, a fairly high cost that corresponds with the quality of work carried out but prevents replication of these projects with the resources of a developing nation.
- Biogas plants have generating capacities of 4.5 m3/day and one with the largest capacity generates 20 m3/day. The biogas plants produce in total 50.5 m3/day biogas, which corresponds to 24 pounds per day of LPG.
- The efficient stove program, developed with funding from CNEE-IADB, reduced fuel consumption by 2/3 and was handled as a microcredit program (paid in full by users in 6 months).
- Three Photovoltaic Project Profiles were also produced.
- 28% of generation goal was implemented and in an optimistic scenario, if 50% of projects with prefeasibility studies were implemented in a period of five years, at the end of that period nearly 1,170 kW would be installed which corresponds to 79 % of the goal result.
- FUNSOLAR has given business training to user associations.

- Regarding the Development of PURE (indicator 10), there were three market studies (coffee, cardamom and tourism) and two business plans (certified timber and tourism), which are documented and structured. There was no implementation because only until the end of the project was there electricity.
- Two enterprise-class production projects (solar pumping and a cell battery charge microenterprises) were implemented. In the latter case there is a high degree of community development, and the operation of a well-established association.
- The results of these studies were presented to different government organizations and international cooperation agencies on June 17, 2008 at the seminar entitled "Lessons from rural electrification in isolated sites".
- For MHP (indicator 11), agreements were established with agencies such as the AEA (US\$ 200,000) for supplies for one MHP and PURE participated in the development of the Japan-Guatemala cooperation agreement (through the Ministry of Energy and Mines, MEM) for 3 MHP, agreement executed by JICA.
- Qualification from local consulting firms to conduct prefeasibility and feasibility studies (indicator 12) was proved. In the development of MHP, prefeasibility studies by PURE were used. In the execution of civil works and installation of the MHP, the participation of national companies and engineers was crucial.
- There has been a significant effort in capacity building (indicator 13). The following results are noteworthy:
 - High degree of awareness of the importance of the RET and the possibilities for income generation among beneficiaries,
 - Organization of the community through associations,
 - Organization of a couple of productive microenterprises
 - Outstanding participation of women, even in positions within the associations.

This result is considered *Satisfactory* (S)

<u>Outcome 2.</u> Development of 13.5 MW of grid-connected private sector RET (small hydropower))

There are 3 indicators for the Outcome.

Achievements:

- In relation to the development of 13,500 kW grid-connected MHP (indicator 14),
 - 26 projects with a capacity of 29,351 kW were identified,
 - 7 projects at the prefeasibility level for 20,852 kW were developed; and
 - 3 with photovoltaic systems connected to the grid with 0.58 kW were implemented.
- The projects in the feasibility phase are looking for resources.
- The goal was 13.5 MW and 0.58 kW were installed (0.004% of the goal!). Despite the efforts of PURE, the private sector did not find attractive MHP projects. It is also important to note that when projects are of municipal scope the chance to obtain long-term loans is seriously affected by legal constraints. Other projects are on land whose property is not defined and therefore are not eligible for credit.
- The project approached communities seeking to identify PURE projects (indicator 15) that would benefit communities.

The achievements of this result are judged as Unsatisfactory (U).

Outcome 3. Sustainable natural and energy resources management in river basins.

There are 3 indicators for this Outcome. <u>Achievements:</u>

- 13 micro basins integrated management plans were developed, creating seven micro basins committees, with plans being implemented and whose members are part of COCODES (indicator 17).
- Four participatory assessments were developed with their integrated management plans.
- The PURE micro basins are fully characterized (location, area, owners and other features).
- The extension of micro basins with action plans totals 15,109.7 hectares, 38% of the target area of the project (indicator 18).
- The project has developed a "Manual of Micro Basins Conservation Practices." To implement these management plans alliances have been made with three institutions (FAO for 4 biodigesters; COFETARN / COMUDE actions for the conservation of micro basins, JICA actions for the conservation of the micro basins of the three MHPs built by them).
- The evaluator found a strong commitment of the communities that were visited with microbasins conservation programs and with the introduction to project techniques.

This result is considered *Satisfactory* (S).

<u>Outcome 4.</u> Conditions for project replication are established (including policy and regulatory proposals); monitoring, learning and evaluation

There are 3 indicators for the Outcome.

Achievements:

- Developing a promotional strategy through direct work with the national government, regional governments, rural municipalities, local authorities and rural communities.
- PURE Work Model to develop project cycles
- Information transfer workshops about the PURE work model for different types of stakeholders were done.
- Establishing within the website <u>http://www.fundacionsolar.org.gt/.%20una</u> a window of information on PURE. This window is also used more intensively to present results and achievements.
- Incidence:
 - Multi sectorial dialogue strategy to support MHP
 - Establishment of the Network of Small Renewable Energy Projects (Spanish: REDPPER)
 - Platform of the Latin American proposal for universal access to renewable energy (Spanish: RENOVE)
- Policy:
 - Proposal for the amendment of Government Agreement 211-2005.
 - Regulation of the Law on Incentives for the Development of Renewable Energy Projects, Decree 52-2003.
 - Presidential Forum on Environment and Development, with 8 institutions, to position the subject of renewable energy.
 - Draft for proposed inclusion of PURE Methodology in energy policy.
 - Proposal for a National Climate Change Policy.

• Preliminary drafting of the Integrated Energy Policy (indicator 21).

• Knowledge Management:

- Best Practices Manual (12 chapters)
- Chel Experience: First isolated micro- central in the country.
- Lessons learned with San Pedro San Marcos Municipal Power Company, as successful example to reinforce similar projects.
- Documentation of lessons learned from the 3 MHP donated by JICA.
- 7 years of lessons learned in the use of renewable energy for productive uses.
- FUNSOLAR has also has been active in seeking institutional support with various international agencies for continuing PURE
- Registration of renewable energy projects in the carbon market has been identified as a task for the project owners (indicator 22) and not for FUNSOLAR.

Although many documents are under revision (lessons learned, successful projects, etc.), the goals of this result have been achieved in a *Satisfactory* (S) manner.

STATE OF THE BARRIERS

The evaluator considers that after the Project, the current state of the barriers is the following:

ENERGY TECHNOLOGY	STATE OF THE BARRIER BEFORE THE PROJECT	STATE OF THE BARRIER AFTER THE PROJECT
Technology: RET connected to grids - small hydroelectric plants Energy supplier - (Energy)	 Socio-institutional Inappropriate agreements on benefits between privates and local communities. Cultural gap between policy makers/ service suppliers and local population. Limited institutional mechanisms for conflict resolution and participation of interested parties. 	 Project benefit distribution was not negotiated. <i>This situation remains the same</i>. Cultural gap related to RET in rural communities <i>diminished a little</i>. Institutional mechanisms for conflict resolution are regulated by the State and <i>remain the same</i>. <i>The socio-institutional barrier was partially removed</i>.
company <i>Type of</i> <i>financing:</i> - Own funds	<i>Policy-regulatory</i> - Lack of regulations to incorporate the RET	 The development of MHP connected to the grid was very limited. Proposals for Regulatory instruments for RET was limited <i>The Policy-Regulatory barrier was partially removed.</i>
- Loan (bank)	Market and Finance - Private investors did not perceive economic benefits by rural communities with electricity - Rural communities don't have income or energy demand to justify investments in energy	The financial barrier for projects like photovoltaic systems, efficient stoves and biodigesters has been removed because users have proved their financial viability. Credit lines are still lacking. The barrier has not been removed in projects of higher investment scale like the MHP.
<i>Technology:</i> Off-grid Energy - mini hydroelectric	<i>Technical</i> - Deficient technical support from the suppliers to implement RET.	• The small RET market has an effect on the high costs and limited technical support by the suppliers <i>This technical barrier was not removed</i>
plant - micro hydroelectric plant - solar PV	Socio-institutional - Cultural gap between policy makers and local population	 The Project developed capacity and strengthened companies with PUE (solar energy, biogas, MHP). This dimension of the Socio-Institutional barrier was removed
 thermic solar <i>Energy supplier:</i> (Energy) 	Capacity and knowledge - Weaknesses in involving productive uses, micro-enterprise management, energy supply	• In addition to previous comments, PURE introduced better river basin management practices.
company - Municipality	and finances, contributing to the lack-of- support cycle structured for PURE.	A significant part of this Capacity and Knowledge barrier was removed
- Community - Final user <i>Type of</i>	Market and Finance - Energy supply based on RET off grid is not related to the generation of income and (micro) financing, which creates a sustainability	Productive use Projects (coffee, cardamom, Wood) were not implemented and the MHP energy is just now starting to be used.This Market and Finance barrier was not removed.

ENERGY TECHNOLOGY	STATE OF THE BARRIER BEFORE THE PROJECT	STATE OF THE BARRIER AFTER THE PROJECT
financing:	problem for projects off grid.	
- Equity	- Lack of loans for micro-enterprises for RET	
(company or final	and PURE.	
user)	- Low access of 'added value' products to	
- Loan (financial	(international) markets	
intermediary)	Policy-regulatory	• There is a database of methodologies, information,
- Grant	- Lack of monitoring tools to show relations	evaluations that have translated into good practices manuals,
(government,	between energy, income generation, natural	administrative manuals, and PURE methodology among
municipality,	resources and risk management in river basins.	other documents that have yet to be edited and diffused.
donor)	- Separate rural development planning and	• PURE has contributed in the discussion of rural
	energy planning in local and national levels,	electrification, but the country has to strengthen even more
	and between government levels	its incipient strategy of rural electrification
	- Rural energy policy, based on grid extension,	
	lacks the framework and consistent	PURE contributed to partially remove this Policy-Regulatory
	instruments to allow communities to Access	barrier.
	the energy service	

In terms of effectiveness, the Project is considered as *Moderately Unsatisfactory (MU)* since the achieved emissions reduction is very inferior to the goals of outcomes 1 and 2, the projects of productive uses only now at the end will be implemented in some cases and the effect of the project regarding barriers is moderate; but on the other hand, an appreciable work in the sustainable management of natural and energy resources in river basins has been made; so a moderate advancement in socio-political and institutional framework aspects, and a big effort on building capacity was made.

Project Execution

It is considered that the implementation quality from UNDP has been *Satisfactory* (*S*). The execution quality was strongly affected by the internal restructuring of FUNSOLAR, which produced delays in the execution and did not achieve results 1 and 2 successfully.

The implementation quality is considered to be *Moderately Satisfactory (MS)*.

Therefore, the general quality of the project's implementation and execution is considered to be *Moderately Satisfactory (MS)*.

Global Evaluation

The qualifications of the performance evaluation of the project are:

1. Monitoring and Evaluation (M&E)	Rating	2. IA & EA Execution	Rating
Overall quality of Monitoring and	S	Overall Quality of Project Implementation	MS
Evaluation		/ Execution	
M&E design at project start up	S	Implementing Agency Execution	S
M&E Plan Implementation	S	Executing Agency Execution	MS
3. Outcomes	Rating	4. Sustainability	Rating
Overall Quality of Project Outcomes	MS	Overall likelihood of risks to Sustainability	ML
Relevance	R	Financial resources	MU
Effectiveness	MU	Socio-Economical	ML
Efficiency	MS	Institutional framework and governance	ML
		Environmental	ML
5. Impact	Rating	6. Overall Project Results	MS
Environmental Status Improvement	S		
Environmental Stress Reduction	S		
Progress towards stress/status change	S		

* For M&E, IA&EA and Outcomes: Highly Satisfactory (HS), Satisfactory (S), Moderately Satisfactory (MS), Moderately Unsatisfactory (MU), Unsatisfactory (U) and Highly Unsatisfactory (HU). For Sustainability: Likely (L), Moderately Likely (ML), Moderately Unlikely (MU), Unlikely (UL), and Highly Unlikely (HU). For Relevance: Relevant (R) or not relevant (NR). For Impact: Significant (S), Minimal (M) and Negligible (N).

The PURE Project as a whole can be considered as *Moderately Satisfactory (MS)*.

CONCLUSIONS AND RECOMMENDATIONS

To MEM, MARN, MAGA and other Government organizations

Conclusions:

- RET use in the rural sector is in line with the environmental policy of the country and the real possibility of improving rural electrification coverage in the country.
- The political will of national, regional or municipal authorities and its support are an essential condition for the execution of projects.

Recommendations⁶:

- To ensure the sustainability of rural electrification systems with RET, additional State support (technical and financial) to rural communities is required.
- For the conservation of natural resources and in particular hydropower, the PURE has demonstrated the validity and importance of mechanisms for community participation and the value of the transfer of technical and management knowledge that are necessary for the conservation of basins.
- On the other hand, the needs of rural world include not only electricity but also other forms of energy (biogas and efficient stoves).
- Disseminate the achievements made by PURE program because it responds to real needs of rural and disadvantaged populations in the country.

TO FUNSOLAR

Conclusions:

- This Project *has significantly contributed to:*
 - Place RET in the discussions on rural electrification in Guatemala
 - Develop PURE methodology and put it forward for energy policy
 - Empower communities through organization and management training in productive projects, natural resource conservation and use of RET.
 - $\circ\,$ Empower women from rural areas and ensure their participation in the project activities.
 - Develop and implement mechanisms for adaptation to climate change, such as watershed conservation.
 - Promote the use of simple, very efficient, technically, environmentally and economically sustainable technologies (efficient stoves and biogas), to reduce GHG emissions.
 - Produce meaningful material for the identification, evaluation and monitoring of projects with RET productive uses.

⁶ The implementation and follow up of these recommendations is beyond project's reach.

- This project has:
 - Promoted and implemented off-grid MHP.
 - Partially complied with the goals of productive uses with RET (Valuable productive chains as coffee, cardamom, wood, were not implemented because RET were not implemented promptly; production chains as ecotourism have begun to be implemented at the end of the project).

Recommendations⁷:

The following recommendations should be executed before the final execution deadline on March 31, 2013 and its implementation should be reported in the Final Report presented by FUNSOLAR.

- Completion of consultancies underway:
 - Systematization the Electric Company of San Pedro Sacatepequez
 - Analysis of the impact of the implementation of renewable energy technologies and watershed management techniques
 - Energy generation with biomass (waste)
 - Between the beginning of this review (October 2012) and the end of 2012, the following tasks were executed that the evaluator had identified at the time as pending:
 - Management of Funds
 - Multisectorial Dialogue Strategy
 - Implementation of 8 biodigesters for productive purposes
- Document all agreements made with beneficiaries, duly signed.
- Attach list of equipment (inventory) and services delivered, auditing records of equipment and works, meeting records and studies delivered to beneficiaries and collect installed equipment warranties.
- Likewise, with the goods received from UNDP
- Formalize (legalize) the transfer of goods and services delivered to the beneficiaries in accordance with the procedures of UNDP
- Keep project equipment warranties and ensure fulfillment, because rural beneficiaries do not know how to proceed against claims.
- Tour of sharing experiences with the accompanying committee. This has been replaced by a meeting with the Board for the presentation of the project results.
- Printing and Socialization of
 - Manual of Recommended Practices
 - Administrative Manual for Community Hydroelectric Projects
- General Systematization of PURE Lessons Learned
- Registration of at least 4 projects in the Clean Development Mechanism (Carbon markets). This will not be done by FUNSOLAR as it corresponds to each one of the representatives of the projects.
- Work to enter the proposed PURE methodology into the Energy Policy
- Financial audit (January-February 2013)

⁷ Annex 6.9. contains de UNDP Management Response Template

- Project Final Report by FUNSOLAR.
- Upload project information to FUNSOLAR website, and direct other organizations links towards FUNSOLAR website.
- Closing Event: Presentation of the final evaluation results and lessons learned with PURE

TO UNDP

Conclusions:

- The formulation of ambitious goals is often counterproductive in terms of final project results.
- It has been demonstrated once again the importance of the Mid Term Evaluations as a tool to redirect the course of the projects.

Recommendations⁸:

- The *co-financing resources* must be *secured* with real disbursement commitments since co-financing letters of intent are insufficient.
- Consider as a certain risk the likelihood that the implementing agency, in the case of NGOs, can dissolve during project implementation.
- The information generated, evaluated experiences and lessons learned from UNDP projects should be shared across a web based platform.
- Continue to strengthen gender perspective as part of the activities in these projects.

LESSONS LEARNED

- Initially 4 years to run a program that hopes to remove national barriers, as intended in the design, is a short time.
- It is necessary to promote the development of a clear policy of Rural Development with the steadfast participation of the State through strategic alliances involving other stakeholders.
- Co-financing resources must be secured with real disbursement commitments since letters of intent are insufficient.
- One of the key aspects to the success of RET projects is to design and consider different management schemes leading to the sustainability of projects.
- The introduction of RET in rural areas is costly regarding the income level of the beneficiaries so that they should receive state support (financial, technical and know-how)
- The high cost of several RET remains a barrier to rural sector development. The proper selection of technologies is essential and their appropriation by the stakeholders in the country.
- The perception of high risks by the private sector and weak market signals, without tariff and regulatory signals that stimulate the penetration of private sector projects will continue to constrain private sector participation in the development of RET.

⁸ Implementation and follow up of these recommendations is out of the project's scope.

1. INTRODUCTION

The United Nations Development Program (UNDP), implementing agency of the *Productive Uses of Renewable Energy in Guatemala– PURE - UNDP-GEF PROJECT (Project PIMS No. 3186)* hired Humberto Rodríguez (hereinafter, the evaluator) to conduct the Terminal Evaluation at the End of Execution Term for the Project. This evaluation is contemplated in the Project Document (PRODOC⁹).

The terminal evaluation is intended to determine the relevance, quality, performance and success of the project. It seeks to identify the impact and sustainability of results, including the contribution to capacity building development and the scope of global environmental goals. It also seeks to identify and document lessons learned and make recommendations that could improve the design and implementation of other UNDP / Global Environment Facility (GEF) projects.

With this assessment there is an opportunity to learn about the success or failure of the project, the sustainability of the results and evaluate lessons learned. It seeks to achieve the following objectives:

- Analyze project implementation,
- Review the progress of the project in relation to the fulfillment of the project objectives and expected results,
- Establish the relevance, performance and success of the project, including the sustainability of results,
- Collect and analyze specific lessons and best practices on the strategies used and the implementation arrangements, which may be relevant to other projects in the country and in other countries.

The **assessment methodology** consisted of:

- Review of documentation (prior to the visit to Guatemala City). The review included analysis of PRODOC, the Project Implementation Reports (PIR), the substantive review of the project and the key factors that determine where the evaluator should focus, all linked to the achievement of the objectives and the implementation and execution. This documentation was received from UNDP Guatemala and the executing Project agency, Fundación Solar (FUNSOLAR).
- Interviews. At the beginning of the mission in the country, the evaluator met in Guatemala City with the following authorities to obtain information and points of views on the project:
 - o UNDP
 - Flor de María Bolaños, UNDP Energy and Environment Officer
 - Nely Herrera, UNDP Monitoring and Evaluation Officer
 - FUNSOLAR
 - Dr. Manuel Basterrechea, Chairman of the Board of FUNSOLAR.
 - Cynthia Loria, Advisor
 - Virginia Rodas, PURE Coordinator

⁹ Project Document. *Productive Uses of Renewable Energy in Guatemala – PURE* - UNDP-GEF PROJECT (Project PIMS No. 3186) (July 17, 2007) United Nations Development Program.

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- Cecilia Marta Estrada, PURE Assistant of Planning, Monitoring and Evaluation
- Lucia España, multi-sectorial strategy to support small-scale hydropower plants (MHP)
- Ministry of Energy and Mines (MEM)
 - Mr. Edwin Rodas Solares, Deputy Vice-Minister of Energy
- National Energy Commission (NEC)
 - Mr. Sergio Velasquez, General Manager
 - Mr. Byron Azurdia
- National Electrification Institute (NEI)
 - Mr. Hugo Rodas Marotta, Division Chief
 - Ministry of Environment and Natural Resources (MANR)
 - Paola Morris, Coordinator of the International Relations and Cooperation Unit
 - Erick Menzel, Environmental Counsel of Environmental Management
- Visit to projects. Projects were visited in four departments (San Marcos, Baja Verapaz, Alta Verapaz, and Izabal) with FUNSOLAR staff. The objective was to find details of the project, the participation of beneficiaries in the implementation of the projects and to know the work and / or studies carried out.
- Information analysis. The acquired information during the mission was analyzed to determine the degree to which objectives were achieved and how the project was implemented.

Project Information. The information (reports and documents) was directly obtained from the executing agency and the UNDP. The Project Implementation Report (PIR) was received from the UNDP for the years 2007 to 2012 (until September) as well as the project's AOP from 2007 to 2012. Also, the reports of external audits (2008, 2009, 2010 and 2011) were considered. Likewise, the Mid Term Review of December 10, 2009 and substantive review of the project on March 2010 were received. The listing of all information received organized by dates is given in Section 6.7 and the electronic version of this report contains all electronic files received.

Once the visits in Guatemala City were finished, the evaluator proceeded to analyze the information received. The evaluator requested additional information to both the UNDP and the Project Coordinator, *having received the latest information electronically on December 4, 2012 for the draft.*

Report Reviews. The evaluator has delivered the following versions:

- December 17, 2012, Draft V1.0 in Spanish, for UNDP and FUNSOLAR revision.
- Final Version (V3.1) in Spanish: Delivered on January 27, 2013, Includes the observations by FUNSOLAR and the UNDP Guatemala Office, the observations of the UNPD GEF Regional Technical Advisor, and the UNDP Management Response Table
- This report is the translation of the Spanish Version 3.2 delivered March 4, 2013.
- The last comments on this version were received May 22, 2013.

2. THE PROJECT AND ITS CONTEXT

2.1 PROBLEM DESCRIPTION

This section is intended to describe the problems that Guatemala faced in terms of social and economic development in rural areas of the country in 2006, the year in which the project was formulated, and the circumstances in which this was made¹⁰.

Guatemala is one of the poorest and most unequal countries in Latin America. Poverty reduction and implementation of the Peace Agreements were two of the main priorities for policy and national affairs. The agricultural and agro-industry sectors played a central role in the economy of Guatemala, in the reduction of poverty and the implementation of the Peace Agreements inherited from the previous decade. However, they are characterized by inadequate and inefficient use of energy that results in reduction of productivity, increased production costs, health problems, and increased environmental load and deterioration. Despite the availability of renewable energy resources, these were not sufficiently exploited to improve the living conditions of the inhabitants or for productive purposes in rural areas of Guatemala.

Renewables energies have the potential to supply energy in rural areas at different production stages. For their introduction, they had a series of social and institutional barriers like, cultural, political and regulatory, information, markets and financial. One of them was undoubtedly the non-inclusion of rural communities targeted by the project in a market and the limited financial capacity to adopt productive infrastructure and introduce renewable generation systems.

In addition to the above, a market niche for interconnected renewable energy development in the private sector had not yet been developed. This was closely linked to the existing legislation for renewable energy, recently created by a regulatory framework in which the private sector could compete with conventional energy production for the national grid. Another barrier limiting the development of renewable energy was the weakness of connectivity and multi-institutional/sectorial coordination for development projects that would benefit private investors and communities utilizing renewable resources for energy purposes. In 2006-2007, private investors had developed small hydro-electric projects through land purchases and direct provision of energy sources without taking into consideration the needs of the surrounding communities. In many cases, communities were not receiving electricity service despite its proximity to the energy source, because there were no incentives for project developers to extend the grid to those users. Thus, local actors had a negative perception towards private investors since the use of their resources did not provide local benefits and they were not able to decide how to manage their resources. As a result, many communities had blocked new projects or blocked the operation of existing projects.

The Ministries of Energy, Environment and Agriculture, along with the National Association of Generators intended to rationalize the use of natural resources in the context of a series of country priorities. These included water resources, watersheds management and rural development activities that were receiving significant support from the international donor community and financial institutions. Joining these efforts, and those related to development of renewable energy for productive uses would strengthen the link between environmental conservation on a global level and the

¹⁰ Project Document. Productive Uses of Renewable Energy in Guatemala-PURE (PIMS 3186). United Nations Development Program. (July 17, 2007).

reduction of poverty in the project area, which faced serious weaknesses due to poverty levels as well as for levels of conflict.

The electricity supply in rural Guatemala has been naturally linked to the expansion of the electric grid and at the time of project formulation, the use of non-conventional energy systems was limited to demonstrative projects. The transition towards renewable energy systems necessarily requires legislation and an appropriate regulatory framework. Therefore, the project development faced at the beginning a series of barriers that will be analyzed later.

2.2 SITUATION BEFORE THE PROJECT

FUNSOLAR conducted several assessments (2000 - 2004) regarding participatory needs in 92 communities in the regions that were the subject of the project, which revealed that the average daily household income was US\$ 1 per day or approximately Q 230 quetzals per month¹¹, placing the region under the extreme poverty line¹². The local economy was based primarily on agriculture (corn, beans, coffee, cardamom and some vegetables). In the livestock farming sector was raising pork and poultry, and cattle grazing. Of the five participating departments, Baja Verapaz, Huehuetenango and Alta Verapaz were among the first four departments in the country with the highest proportion of land suitable for forest production. Three of the participating departments, Alta Verapaz, Quiché and Huehuetenango were suitable for water collection.

At the time of project formulation, generation of electricity nationwide was 64% fossil fuels and 36% hydro and large scale geothermal power. The primary energy was characterized by a strong dependence on firewood (49% of primary energy final consumption in 2003)¹³. Although forest covering the country was approximately 31%, growth in demand for firewood continued and the vulnerability of its availability indicated the need to diversify energy supply. Guatemala had a hydropower potential of 10 GW, of which 5 GW could be developed with small-scale¹⁴ hydroelectric projects with minimal environmental impacts¹⁵. The country had other renewable energy resources (geothermal 100 MW, 200 MW wind power, and solar power 5 kWh/m²/day annual average).

The pattern of energy consumption in the states covered by the project was well below the national average. The electrical network coverage in the project area was 71%, but 51% in rural areas. The main sources of energy for rural dwellers were kerosene lamps and candles for lighting and firewood for cooking. Women were affected on their health by the use of firewood and its gathering. Some communities used diesel generators for lighting and other basic energy needs including processing of agricultural products. It is important to note that people who had no electricity service paid 6 to US\$ 8 monthly for illumination. FUNSOLAR in 2002 showed that households below the poverty line (mostly indigenous) spent about 40% of its total income in these lower sources of energy¹⁶. The regions of the project had a good potential for small hydraulic power and abundant solar radiation.

¹¹Exchange rate at the time of Project formulation

¹² Socio-economic Diagnosis of Quiché (2000) Fundación Solar, Guatemala City, and Socio-economic Diagnosis of the Franja Transversal del Norte (2001) Fundación Solar, Guatemala City.

¹³Incentives for the Development of Projects of Renewable Energy (Ministry of Energy and Mines, 2003)

¹⁴ The definition of *small* scale varies in international literature, but includes small hydroelectric plant (< 15 -30 MW), mini hydroelectric (< 3 MW), micro hydroelectric (< 300 kW) and pico hydroelectric (< 1 kW)

¹⁵Energy in Guatemala, prepared for the National Secretary of Strategic Analysis of the Guatemala Government (Iván Azurdia Bravo, 2004)

¹⁶ Socio-economic Study for El Quiché. Solar Foundation. (2002) Guatemala City

Given these needs of the rural sector, the possibility of using renewable energy (RE) and the challenges their use entailed, the Government of Guatemala asked the United Nations Development Program (UNDP) the preparation of a project of technical assistance for *Productive Uses of Renewable Energy in Guatemala - PURE*, to be presented to GEF for approval and funding¹⁷.

Moreover, this problem was an opportunity to reduce emissions of greenhouse gases (GHG) and that rural households could opt for the use of petroleum fuel generators, the reduction of GHG was of interest of GEF and in line with the environmental policy of the country, even though Guatemala was in 2007 a modest GHG emitter (even in 2008, emissions were 11.9 M ton CO_2 equivalent, 12.73 M inhabitants was the population in 2007, for emissions of 0.94 tons CO_2 / capita / year). Guatemala was also a *nation eligible for GEF projects*. In line with its environmental policy, *Guatemala ratified the United Nations Framework Convention on Climate Change* (UNFCCC) on March 28, 1995.

An additional factor that contributed to the formulation of the PURE project was the quest to the fulfillment of the Millennium Development Goals (MDGs), many of them promoted by the power supply in the rural sector and in particular Goal # 7, which is to integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. Therefore, *at the time there was a coalescence of factors that led to the formulation of the program*.

2.3 GENERAL OBJECTIVE OF THE PROJECT

The PURE aims to remove barriers to the adoption of renewable energy technologies (RET), mainly mini / micro-hydroelectric plants (MHP), by promoting productive uses of energy in one of the poorest areas in Guatemala: the provinces of Alta Verapaz, Baja Verapaz, Quiché, Huehuetenango and San Marcos. The project would create new local jobs and sources of income, and mitigate 1.75 million tons directly and indirectly 5.25 million tons of CO_2 equivalent during 20 years. This would be accomplished by promoting RETs, which are linked to income generation and improved productivity, adding value to local agricultural crops. The sustainability of productive uses would be strengthened through the application of adaptive mechanisms that addressed the management of natural resources and vulnerability problems where projects were developed, providing the necessary structural support for the formulation of policies and regulations relevant, and by supporting national and local dialogue between multiple stakeholders for a long-term collaboration. The total budget required for this endeavor, which is complementary to the ongoing efforts of the Government of Guatemala for poverty reduction, rural development and the promotion of activities of watershed management, was estimated at US\$ 12.67 million, with US\$ 2.55 million requested to GEF to cover the incremental costs.

The focal area of the project are northeast and northwest regions of the country (the departments of Alta Verapaz, Baja Verapaz, Quiche, Huehuetenango and San Marcos), which were affected by the armed conflict and where 29% of the population is located¹⁸. The population of this area (about 32,000 km²) is mainly of Maya descent, including the following ethnic groups: Q'anjob'al Jakalteko, Chuj, Mam, Ixil, Q'eqchi ', Poqomam, K'iche' and Kaqchikel, all of which have a language other than Spanish. These people had received the aftermath of war and the impact of the problems with the restoration of peace. The efforts proposed in the PURE are linked to the commitments of the

¹⁷ PDF-B. Productive Uses of Renewable Energy in Guatemala. Government of Guatemala, UNDP, Fundación Solar (2006) Guatemala City

¹⁸ 2000 Census. National Institute of Statistics (2002) Guatemala City

Guatemala Peace Accords to enable income generation programs and projects that take into account both cultural and environmental aspects.

2.3.1 Identified Barriers for the Project

By the year 2007, the related capacity of Renewable Energy Technologies (RETs) in Guatemala was limited in various aspects and levels. Apart from some small-scale trials, the experience was insufficient to address outreach programs and coverage. There was also a lack of knowledge of RET technologies by potential users, regional governments, project evaluators, managers of project financing, etc. Nor were there many project developers with RET, and their technical and operational characteristics were unknown.

The barriers identified in the PRODOC, after a thorough analysis, were classified depending on the connection of RE Technology (RET) to the network (grid-connected or off-grid). Depending on the type of connection, you had different types of energy service providers (private or municipal or community or simple end user) and different types of financing (equity, banking, government grants, donations). They were then grouped into categories as follows:

Technology: RET connected to the grid (Small hydroelectric plants)

- Socio-institutional barriers
 - Inadequate benefit sharing agreements between private investors and local communities to manage natural resources
 - Cultural gap between policy makers / service providers and local people
 - Limited institutional mechanisms for conflict resolution and participation of stakeholders
- Policy and regulatory
 - Lack of regulations to incorporate RETs as PUE, creating an uneven playing field for grid projects based on RETs.
- Market and Finance
 - Private investors do not realize economic benefits of providing access to electricity to rural communities
 - low-income rural communities have no income or energy demand needed to justify investments in energy

Technology: RET Isolated from grid (small hydroelectric plants)

- Technical
 - Poor technical support by vendors and suppliers to implement the RETs in the rural context
- Social-institutional
 - Cultural gap between policy makers and the local population
- Capacity and knowledge
 - Weaknesses in linking productive uses, micro-enterprise management, energy supply, and finance, contributing to the continuation of the cycle of lack of structured support for PURE
 - The weak links in the development of energy (hydraulic) and management of natural resources (land, water, forests) in community planning and national
 - o Lack of interdisciplinary knowledge to work simultaneously in the field of rural

energy and productive uses

- Lack of knowledge at the community level in small business management
- Market and Finance
 - The power supply based on off grid RET is not linked to income generation and (micro) financing, which creates a problem of sustainability for projects outside the electricity network.
 - \circ $\;$ Lack of loans for micro enterprises for RET and PURE $\;$
 - Weak access of 'added value' products to the markets (international) and high transaction costs for 'fair trade' or products 'environmental certification'
- *Policy and regulatory*
 - Lack of monitoring tools for decision makers to reflect explicitly energy links to, income generation and natural resources and risk management in the areas of watershed
 - Separate rural development planning and energy planning at local and national levels and between levels of government
 - The rural energy policy, which focuses on the extension of the electricity grid, lacks consistent frameworks and tools that allow communities outside the network to access energy services

The project strategy products were designed to remove each of the categories of barriers.

The *expected situation of the barriers at the end of the project* was that when removed by project implementation, it would cause an effect at national level for the establishment of a market for RET that would develop both rural and urban regions, benefiting rural areas through productive uses of energy, promoting conservation of renewable natural resources and allowing to reduce emissions of greenhouse gas produced by the energy supply in rural areas.

2.3.2 **PRODOC Formulation**

Based on the results of the PDF-B the Project Document (PRODOC) was developed. The final version (17 July 2007) provides for the implementation of a Full Size project, with 4 components, to develop in four years.

The project components are designed to remove the identified barriers. However, the evaluator considers that the project has for components 1 and 2 very ambitious goals, something that was also considered by the executor and the implementing agency, so that together with the other actors of the project conducted a substantive review on March 31, 2010 to reconsider the scope of activities. They also reviewed and adjusted the goals of the project indicators.

The value of the project was US\$14.05 million with a GEF contribution of US\$2.55 million, the government of Guatemala co-financing US\$9.325 million, private sector US\$1,000,000, others US\$1,000,000 and by FUNSOLAR US\$175,000 in kind.

2.3.3 **Project Approval by GEF**

The project proposal was approved by the GEF Council in February 2005. Following the procedures of UNDP-GEF, the PRODOC was signed by the parties: FUNSOLAR (August 2, 2007), the Government of Guatemala (2 August 2007) and the UNDP on August 6, 2007.

It is noted that the program *meets the Millennium Development Goals, Goal No.* 7: Ensure Environmental Sustainability and consequently, with the Strategy for Poverty Reduction, and was *in line with the country's environmental policy*.

2.4 START DATE AND PROJECT DURATION

The project effectively began on August 6, 2007, with an initial term of four years (until September 30, 2011). The implementation period was extended twice: once for a year and three months (until December 31, 2012) mainly due to delays in implementation, due to the interdependence of the components in the actual execution of the project that were not properly considered in the formulation of the PRODOC (for example, it is not possible to advance projects of productive uses until the installation works of the energy generating systems has actually started), and delays arising from institutional adjustments by FUNSOLAR in 2010, as well as those arising from the substantive review of the project in March 31, 2011.

During this evaluation, the evaluator recommended the request of a second deadline extension of three months. On December, 10 2012 FUNSOLAR requested the UNDP to extend the contract period until March 31, 2013. The extensions of time totaled one year and six months.

This project *was therefore executed with 138% of the time of its initial term*. By November 2012 the project was in the final evaluation, thus complying with this requirement of GEF. Table 2-1 shows the major milestones of the program.

Activity	Date
Project Document Signature (Funsolar and GoG) Date	02/08/2007
Project Document Signature (UNDP Gautemala) Date	06/08/2007
Start-up Poject Date	06/08/2007
Mid Term Evaluation Date	10/12/2009
Substantive Project Review Date	31/03/2011
First Revised Planned Closing Date	30/06/2011
Original Planned Closing Date	30/09/2011
Final Term Evaluation Date	01/11/2012
Second Revised Planned Closing Date	31/12/2012
Third Revised Planned Closing Date	31/03/2013

Table 2-1. Main events of the Project

Source: Compiled by evaluator

2.5 **PROJECT OBJECTIVES**

The global environmental objective (project goal) is to reduce emissions of greenhouse gases from Guatemala by promoting productive uses of renewable energy, with strong rural development benefits. The implementation of the project will result in a direct reduction equivalent to 1.75 million tons of CO_2 , and indirect reduction equivalent to 5.25 million tons of CO_2 , with a time span of over 20 years, replacing the current use of fossil fuels to renewable energy.

The development objective of the project is the exploitation of renewable energy resources available locally built with environmentally sustainable development and poverty reduction in rural areas. Expected advances are tentatively 13.5 MW of small hydro power connected to the grid and about 1.5 MW of off-grid energy supply, mainly mini / micro hydropower.

The objectives of the project are four and are focused on¹⁹:

1) Identifying and developing productive uses of renewable energy that directly or indirectly benefit the inhabitants of the rural poor by generating employment and aggregate purchasing power,

2) The development of projects of connected and isolated electricity networks of the grid, that generate at least 15 megawatts of renewable energy,

3) Sustainable use of natural and energy resources and reducing vulnerability through integrated watershed management across 7 sites, and

4) The promotion of a competent legal and institutional framework with the Government of Guatemala to eliminate barriers that currently impede the production of grid energy independent and application of renewable energy technologies-grid.

2.6 **PROJECT OUTCOMES AND PRODUCTS**

To remove the identified barriers, exhaustively analyzed for the PRODOC formulation, four Outcomes were designed:

- Development and promotion of 1.5MW of technologies for Productive Uses of Energy (PUE) outside the supply network.
- Development of 13.5MW of energy and the promotion of RET connected to the energy supply network (MHP)
- Sustainable management of natural and energy resources from river basins.
- Establishment of conditions for Project replication (including political and regulatory proposals); monitoring, learning and evaluation.

Each component has its expected products, activity proposal and a budget for its execution, as follows:

¹⁹ PRODOC (Spanish Version), Executive Abstract, Page 1.

• <u>Outcome 1:</u> Development and promotion of 1.5MW off-grid technologies for Productive Uses of Energy (PUE)²⁰

For this Outcome five products are expected.

- Integration of local "value added" produce in the existing market chains because of the introduction of RET
- Development of 1.5 MW of off-grid solar and micro hydroelectric power plants
- Increased mobilization of capital for PUE loans in the project area
- Local capacity building and strengthening of small and micro enterprises, based on PUE requests
- Review of the technological support and isolated RETs marketing from the power supply

The total amount budgeted for this Outcome is US\$7,015,909 [GEF: US\$979.305, Government: Ministry of Agriculture, Livestock and Food (MAGA) US\$4,976,604 (cash), MEM \$400,000 (cash) MUNICIPALITIES \$600,000 (cash); FUNSOLAR US\$60,000 (in kind); Users \$0; Private \$0]. This *represents 49% of the total project budget* and is therefore from the point of view of budgetary allocation the most important of the project.

• <u>Outcome 2</u>: Development of 13.5MW of energy and the promotion of RET connected to the energy supply network (Mini hydroelectric plant)

Three products are expected from this Outcome:

- Development of 13.5 MW of hydropower, connected to the network and surrounding communities.
- Productive uses of energy for rural development catalyst in communities associated with the investment of RE.
- Participation of actors or stakeholders and implementation of "best practices" environmental projects in developing small-scale hydropower.

The total amount budgeted for this Outcome is US\$4,563,219 [GEF: US\$647.415, Government: MAGA US\$1,970,804 (cash), MEM \$500.00 (cash), municipalities \$400,000 (cash); AGER \$1,000,000, FUNSOLAR US\$45,000 (in kind); Users \$0; Private \$0]. This represents 31.8% of the total project budget and is therefore from the point of view of budgetary allocation the second most important of the project.

• <u>Outcome 3</u>: Sustainable natural and energy resources management in river basins.

Two products are expected from this component:

- Facilitation of local spaces for participatory watershed management, integrated to natural resource management for renewable energy generation and vulnerability issues.
- Best management practices for agriculture, agro-forestry, forestry and animal breeding.

²⁰ PRODOC, page. 17 and following

The total amount budgeted for this Outcome is US\$1,337,092 [GEF: US\$254.500, Government: MAGA US\$1,052,592 (cash), MEM \$0 (cash), MUNICIPALITIES US\$0 (cash); FUNSOLAR \$30,000 (in kind); users US\$0; Private \$0]. This represents 9.3% of the total project budget.

• <u>Outcome 4</u>: Conditions for project replication are established (including policy and regulatory proposals); monitoring, learning and evaluation

For this Outcome four products are expected:

- Monitoring, learning, feedback and assessment.
- Proposal of regulatory instruments that create a favorable environment for the independent generation of small-scale hydropower.
- Policy guidelines proposals for rural energy supply outside the supply network with small-scale hydroelectric plants and solar power.
- Enhanced political dialogue on the links between energy supply, rural development, natural resource management and climate change adaptation.

The total amount budgeted for this outcome is US\$658.780 [GEF: US\$518.780, Government: MAGA \$0 (cash), MEM \$100.00 (cash), municipalities \$0 (cash); FUNSOLAR US\$40,000 (in kind), Members \$0; Private \$0]. This represents 4.6% of the total project budget.

In addition to these results, US\$475,000 was budgeted for the Project Management Unit, of which GEF would provide US\$150,000 and 325,000 from FUNSOLAR in kind. One should also consider the cost of the PDF-B with a value of US\$100,000 from the GEF and US\$28,000 from FUNSOLAR in kind.

The activities guide for the results and products sought, and its indicators and targets are given in detail in the $PRODOC^{21}$.

2.7 PROJECT INDICATORS AND MONITORING AND EVALUATION

The logical framework matrix of the PRODOC established performance and impact indicators for project implementation (42), and for different moments in its execution (project baseline, mid-term and final), with sources of verification²². These indicators and sources of verification are the basis of the monitoring and evaluation that have been used in the course of project implementation by both the UNDP and FUNSOLAR as the mid-term evaluators.

After the mid-term evaluation it was considered necessary a substantive revision of the project given that its scope was very ambitious. As a result of the review final indicators were reconsidered establishing 22 and focused not only in implementation but also in the identification of projects. These indicators are will be used in the next chapter when evaluating the results of the project.

²¹ PRODOC, page. 17 and following

²² PRODOC, pages 30 and 31
2.8 PROJECT IMPLEMENTATION AND EXECUTION

The project's organizational structure is shown in Figure 2-1. Agencies directly committed in the Project are the implementing and executing agencies. Described next are their functions and responsibilities.

2.8.1 Implementing Agency: UNDP Guatemala

The Project's implementing agency is UNDP Guatemala. The project was to be managed according to the regulations and administrative procedures established by UNDP. The UNDP had functions such as:

- Managing and distributing program funds on behalf of the GEF,
- Provide assistance in the process of acquiring equipment, if required, and ensure that the process of selection of both national and international consultants, and subcontracting, will be held following competitive and transparent processes,
- Provide assistance with GEF formal procedures regarding reporting,
- To be the formal channel through which correspondence is handled between the project and UNDP-GEF, and
- Be responsible for monitoring the ongoing program progress.

Also:

- Appoint a Program Officer as the focal point for this program,
- Provide administrative support and financial and budgetary monitoring to the program implementation,
- Provide accounting, financial and budget documentation for the project
- Conduct the annual audit of the program following the procedures of the GEF,
- Charging a fee for the provision of services in accordance with corporate guidelines on UNDP Cost Recovery (Medium-High cost level in the Universal Price List)²³.

²³ ISS was not charged in this project.

Figure 2-1. Organizational Structure of the Project according to the PRODOC



Source: Taken from PRODOC, page 46.

2.8.2 Executing Agency: FUNSOLAR

The executing agency of the project was FUNSOLAR (NGO / CSO). FUNSOLAR has successfully worked with the UNDP Guatemala and the Ministry of Energy and Mines in previous sustainable energy projects. FUNSOLAR is a private development organization, formally registered in Guatemala in 1994 by Ministerial Decree No.302. Its main areas of work are sustainable energy services, environmental services and integrated management of water resources. Since its creation, FUNSOLAR has accompanied different rural development processes through the implementation of programs and projects focusing on the development of local capacity, strengthening community-based organizations, identifying institutional partnerships to encourage the management and sustainable use of natural resources as a means of reducing poverty and protecting the environment and cultural heritage.

FUNSOLAR was to be responsible for overseeing the general aspects of the project and be responsible for the design, management and monitoring of the project components, the approval of each of its activities and specific terms of reference, the hiring of professional staff service and equipment, to report on the development of the project and payment orders.

2.8.3 **Project Steering Committee**

Under the program *Global Village Energy Partnership* (GVEP), the Government of Guatemala (GOG) formed in 2003 a Working Group, chaired by the then Minister of Energy and Mines (MEM) and then made up the Ministry of Environment and Natural Resources (MANR), the Ministry of Food, Agriculture and Livestock (MAGA), Secretary of Planning and Programming of the Presidency (SEGEPLAN), the Ministry of Economy (MINECO), the Ministry of Health and the Ministry of Education, and NGO representatives. The PURE project would use this existing mechanism for coordinating multiple actors as the Project Steering Committee (PSC). The PSC will provide guidance and oversight in the implementation of the project.

Coordination through PSC focuses on two main activities:

- Identifying synergies between different actors (GoG, local communities, private sector, local government and the donor community) to channel funds to implement the project based on value-added production chains using RET and require an integrated watershed management to take advantage of renewable natural resources, and
- Coordination with other projects, funded by the UNDP, the World Bank (WB) and the Inter-American Development Bank (IADB) and other donors (but executed by the key government ministries mentioned above) will have activities related to watershed management, agroforestry and development of microenterprises.

Since the GVEP work group included SEGEPLAN (national institution that coordinates international cooperation) and other government entities, such as MAGA, MANR and MEM, GVEP participation was possible to develop and update PSC coordination with other national and regional projects in progress, executed by these entities, such as:

• National Rural Development Program, Phase 1 (funded by IFAD through MAGA and administered by the UNDP).

- National Capacity Building for Stage II Adaptation to Climate Change (administered by UNDP and executed by MARN).
- Integrated Indigenous Regional Ecosystems (funded by the IADB and the World Bank, with a contribution from the GEF).
- Project to Support Rural Development Program (SEGEPLAN, funded by the WB / IADB / Sweden).

The PSC was to meet at least four times during the first year. The meetings would be convened by the President through the Secretary. These meetings present and analyze the progress of the project during the respective period; its members would receive in advance the documentation on project implementation, results, fulfillment of objectives, etc.

Also, representatives of regional governments, community members, other organizations and experts involved, were to be invited to participate in the Committee, according to the nature of the topics to be addressed in due course.

Thus the performance of the PSC would enhance and strengthen the project by coordinating with other state agencies, donors and other stakeholders in the development of renewable energy in an environmentally sustainable manner.

For the execution of the Project the following units were established and the following staff was required:

2.8.4 Project Management Unit

Together with full or part-time project staff²⁴, the *Project Coordinator* forms the *Project Management Unit*, that will be externally supported by a part-time GEF *Technical Advisor*, contracted by UNDP, and *subcontracted parties* to carry out the specific project activities of the project²⁵.

PMU's role was to direct the PURE project on a daily basis in a flexible way. The major result of PMU was to assist FUNSOLAR and the outsourced parts under PURE in implementing the methodology and recording activities, successes and failures of these components of the entire project.

2.8.5 Project Coordinator

The executive director of the PMU would be the *Project Coordinator* (PC) to give strategic direction of the PMU and assume ultimate responsibility for the planning and quality of all project results. The PC would have the ultimate responsibility to advise and provide all necessary information on the progress of the PURE to the PSC and members of the PMU. The PC would be responsible for:

²⁴ Additional PMU staff of the Project (full or part time) could include national advisors: (i) One advisor of rural energy infrastructure, (ii) one finance-administrative advisor, (iii) one rural economy, micro financing and rural credit specialist, (iv) one micro-enterprise and organization specialist, (v) One gender and energy specialist, (vi) one solar energy specialist, (vii) one hydroelectricity specialist, and (viii) bilingual workers: Spanish/local languages.

²⁵ Terms of Reference of the Project Coordinator and PMU are presented in Section E of the PRODOC.

- Formulating and present the work and financial plans to the PSC,
- Monitoring the work progress,
- Coordinating with the various departments and agencies timely supply of inputs from government,
- Providing guidance of the project to the team of national and international consultants,
- Coordinating with the UNDP, reviewing reports and ensuring compliance of administrative processes under the procedures of UNDP.

2.8.6 International Technical Advisor

The UNDP had to select and hire an International Technical Advisor (ITA) with wide experience and according to terms of reference and conditions set out in PRODOC²⁶, for two months a year and for all the time of project implementation. His main responsibilities are:

- Provide expertise and advise the Project Coordinator and the PSC;
- Assist in the planning of the implementation of the work plan;
- Assist in the development and implementation of the monitoring and evaluation plan;
- Assist in developing workshops (national) and assist in the identification of international participants and identifying international consultants;
- Assist in the preparation of Terms of Reference (TOR);
- Participate in periodic evaluations of the project and project workshops (at least once a year to provide advice during the preparation of the annual work plan and / or discussion of the plan in the PSC);
- Participate in other meetings related to the project and provide advisory services (in missions to Guatemala or local) while they're needed.

Other Staff

Another PMU staff (full time and part time) could include: (i) rural energy consultant, (ii) a financial advisor and administrative, (iii) a rural economist, (iv) a specialist in micro-enterprises and organization, (v) a gender and energy specialist, (vi) a specialist in solar and hydro energy, (vii) an expert specializing in hydropower, and (viii) Spanish and local languages bilingual social workers as well as (viii) basic administrative staff

In addition, consultants and subcontractors would be hired to perform specific tasks of the project according to the final project programming, such as institutional development, capacity building, workshops designers and facilitators, hydropower plant ground development, etc. Subcontractors may be individual and/or organizations (not under the employment of the project). The program set out from the beginning the TOR for procurement required for implementation.

Administratively, FUNSOLAR would be responsible for reporting to the PSC and UNDP Guatemala for US\$2.65 million from the GEF. GEF resources would be transferred to FUNSOLAR's Finance and Accounting Department through direct payments. In turn, FUNSOLAR was to disburse funds through

²⁶ PRODOC, page 130

sub-contracts and grants, and closely monitor their use by applying for financial and technical reports. The co-financing of US\$11 million would be administered individually by each of the partner organizations and each would develop their own mechanisms and accountability criteria.

2.9 **PROJECT SCHEDULE**

The Project Schedule was made in a very detailed²⁷ way in the PRODOC and does not allow having a group vision of the project's activities.

2.10 PROJECT BUDGET

The following table shows the total budget of the project that totals US\$ 14,328,000, including the PDF-B at a cost of US\$278,000, shared between FUNSOLAR and GEF (Table 2-2). As shown, a determinant key of the project success would be cash contributions mainly from MAGA and MEM *with resources expected for US\$9,000,000 would have great impact on activities 1 and 2*, since about 90% of the resources of these two institutions would go to activities 1 and 2: the development of RET.

Table 2-2. Project Budget in 2007 US\$

				Cof	inancing GoG					
	Outcomes	GEF	Co financing in kind	Co fin Cash MAGA	Co fin Cash MEM	Co fin Cash Municipalit ies	Co fin Cash AGER	Co fin Cash FunSolar	Subtotal (USD\$)	Share (%)
1	Development of off-grid RET and PUE	979,305	60,000	4,976,604	400,000	600,000			7,015,909	49.0%
2	Development of on-grid RET and PUE	647,415	45,000	1,970,804	500,000	400,000	1,000,000		4,563,219	31.8%
3	Sustainable natural & energy resources	254,500	30,000	1,052,592					1,337,092	9.3%
4	Replication; monitoring, learning, eval.	518,780	40,000		100,000				658,780	4.6%
	Project management unit	150,000	325,000						475,000	3.3%
	PDF - B	100,000	28,000					150,000	278,000	1.9%
	Total (including PDF -B)	2,650,000	528,000	8,000,000	1,000,000	1,000,000	1,000,000	150,000	14,328,000	100.0%

Source: UNDP-GEF – PRODOC, page 64.

Figure 2-2 shows the Budget breakdown by component and financing source (logarithmic scale).

From this budget, the largest contributor is the GoG (69.8%), with significant input from the GEF (18%) and private contributor AGER (7%), and finally FUNSOLAR (1%) (Figure 2-3). Most of the resources were allocated to the development of RETs outside and connected to the network (Activities 1 and 2, 80.8%) and the conservation of renewable resources (9.3%) (Figure 2-4).

²⁷ See PRODOC. It has a 19 page extension.



Figure 2-2- Budget by activity and financing source (2007) (logarithmic scale)

Source: UNDP- GEF PRODOC, taken from page 64 information



Figure 2-3. Project financing (2007)



Figure 2-4. Participation of project activities in the budget (2007)

3. FINDINGS AND CONCLUSIONS

The objective of this chapter is to show the findings and conclusions of the Project's formulation, implementation and outcomes in order to show a final global evaluation.

The following table shows a summary of the project's performance evaluation ratings for monitoring and evaluation, performance of the implementing and executing agencies, evaluation and sustainability outcomes.

1. Monitoring and Evaluation (M&E)	Rating	2. IA & EA Execution	Rating
Overall quality of Monitoring and	S	Overall Quality of Project	MS
Evaluation		Implementation / Execution	
M&E design at project start up	S	Implementing Agency Execution	S
M&E Plan Implementation	S	Executing Agency Execution	MS
3. Outcomes	Rating	4. Sustainability	Rating
Overall Quality of Project Outcomes	MS	Overall likelihood of risks to	ML
		Sustainability	
Relevance	R	Financial resources	MU
Effectiveness	MU	Socio-Economical	ML
Efficiency	MS	Institutional framework and governance	ML
		Environmental	ML
5. Impact	Rating	6. Overall Project Results	MS
Environmental Status Improvement	S		
Environmental Stress Reduction	S		
Progress towards stress / status change	S		

Table 3-1. Qualifiers of the Project's performance evaluation

• For M&E, IA&EA and Outcomes: Highly Satisfactory (HS), Satisfactory (S), Moderately Satisfactory (MS), Moderately Unsatisfactory (MU), Unsatisfactory (U) and Highly Unsatisfactory (HU). For Sustainability: Likely (L), Moderately Likely (ML), Moderately Unlikely (MU), Unlikely (UL), and Highly Unlikely (HU). For Relevance: Relevant (R) or not relevant (NR). For Impact: Significant (S), Minimal (M) and Negligible (N).

The PURE Project as a whole could be considered as *Moderately Satisfactory (MS)*.

The following sections are the considerations that gave to the project the above qualifiers.

3.1 **PROJECT FORMULATION**

This section has as an objective to describe and assess²⁸ how efficiently the concept and design of the Project could face the project's problem, emphasizing in the consistency and logic of the project's strategy and logic framework.

3.1.1 Conceptualization / Project design

The *project is consistent* with GEF Operational Program # 6, "Promoting the Use of Renewable Energy by Removing Barriers and Reducing Implementation Costs"²⁹. The project is also in line with the GEF strategic priorities of CC4, and Productive Uses of Renewable Energy. In addition, the integration of watershed management to improve the sustainable management of natural resources is aligned with the strategic priority of adaptation. The *project is also in line with the environmental policy of Guatemala*.

One of the priority programs of Guatemala's government policy is rural sector development, where one of the determining factors to improve the living conditions of its inhabitants and the productivity and income of the population is the supply of electricity. The GoG has advanced in the Rural Electrification Plan (REP) using resources from the privatization of the energy sector based on the Electricity Act 1996 and loans from the Inter-American Development Bank (IADB). The REP has made significant progress since the degree of electricity coverage has increased from 55% 10 years ago to 85% in 2012. REP ends in 2012.

REP funding has come primarily with resources from the privatization of the electricity sector. However a large population in the Northern Zone lacked electricity, costs of extending networks exceeded the indicative costs used in the programs, with the potential for development of agricultural and ecotourism activities and socio-cultural characteristics of the Mayan communities strongly rooted to their traditions and land, with a strong sense of environmental conservation. In these circumstances the possibility of developing RET in an environment with potential of solar and hydro energy, associated with productive activities and watershed conservation, is an extraordinary opportunity as a technical, economical and environmentally viable alternative over grid extension or the use of generators based on petroleum fuels, the latter emitting GHG. The development of these projects using renewable energy for productive uses in rural communities was also an excellent opportunity to empower them, seeking their social and economic development in harmony with the conservation of the environment and natural resources. These policies and commitments on a path towards sustainable development and social equity are conceptually well intertwined in the characterization of the project.

The formulated project targets the removal of the identified barriers. Barriers were well identified and mechanisms to remove them were appropriately proposed. However it is necessary to consider the

http://207.190.239.143/OP 6 Spanish.pdf

²⁸ All the sections of Findings and Conclusions labeled with (E) in the TOR should be assessed as Highly Satisfactory (HS), Satisfactory (S), Moderately Satisfactory (MS), Moderately Unsatisfactory (MU), Unsatisfactory (U) and Highly Unsatisfactory (HU).

²⁹ The objectives of this Operational Program intend to: a) Eliminate the obstacles to the use of commercial or semi-commercial renewable energy technologies, and b) reduce any additional execution cost of the mentioned technologies resulting from the lack of practical experience, of initial markets of low volume or of despair application matter, with the purpose of transactions and activities "without losers" and economically profitable that improve deployment of renewable energy technologies.

scope of the established results. While it is understood that the purpose of the project is also to act as a catalyst for achieving the results, we find that the results 1 and 2 of the project are extremely ambitious in seeking to develop or encourage the development 1.5 MW in off grid systems and of 13.5 MW with systems interconnected to the network, and all this in a horizon of four years as initially formulated.

Practice has shown that this has not been achieved in full (developing 451 kW was achieved with three MHP donated by Japan), despite the work of the PURE project in five years, as discussed below.

The evaluator also considers numerous indicators were established for the entire project (22 after the substantive review of the project, much more in the PRODOC), highly disaggregated and extensive. This observation has already been made by Mr. Rijs in the mid-term evaluation conducted at the end of 2009, which recommended to "simplify and strengthen the set of indicators" inviting the PURE project team to "review the logical framework and add the corresponding verification sources" looking to propose a simplified logical framework based on the ultimate goals for the project³⁰. In the mid-term evaluation by A. Fabris in December 2009, he welcomes this recommendation.

This recommendation led to a substantive Review of the Project (SR)³¹, a little over a year after the recommendation made. This review was conducted by a broad group of experts³² whose main objective was to review the changes necessary for the PRODOC motivated by FUNSOLAR's concerns given that "some indicators are too ambitious for the short duration of the project" and clarifying the catalyst role of the project. FUNSOLAR undertook an internal review aimed at establishing the achievable goal by 2011 and proposed changes to the indicator when appropriate. The result was a series of goals set at the end of the project with their observations. Those are the ones to be used in this report.

Therefore, the development objectives and immediate objectives and their formulated results in the logical framework are consistent with barriers to remove but the indicators of the *Global Environmental Objective and their 1 and 2 results are ambitious. However, the objectives and results of the project are also in line with government initiatives in Guatemala.*

The implementation strategy of the project is considered successful because FUNSOLAR participation and its direct relationship with the institutions of the GoG through the Steering Committee, was the appropriate institutional framework for its development. It should be noted that FUNSOLAR is an NGO experienced in developing such projects in Guatemala, having proven to be successful in running a small scale project with GEF previously and have received the top qualifiers in the ability to track Solar Foundation³³.

However, the convening capacity and institutional mobilization FUNSOLAR against government institutions was overestimated. That was how the GoG initial commitments were not finalized although afterwards government institutions did contribute to the co-funding but not in the initial amount and the proper opportunity.

³⁰ Quoted in Fabris, A. (2009) PURE Mid-term Evaluation, see note in page 12.

³¹ PURE Substantial Revision, Act of Meeting had on March 31, 2011.

³² Two Guatemala UNDP staff members participated, UNDP-GEF Technical Regional Advisor and five FUNSOLAR officials.

³³ PRODOC, Annex G.

Another factor affecting project implementation has been internal staff changes in FUNSOLAR that occurred in 2010 that forced at the time to rebuild the personnel engaged in the direction and execution of the project directly. That situation was properly dealt with but took time and caused delays in project implementation mainly during 2010. This concern was manifested in the RIP in June 2010 by the Regional Technical Advisor of the UNDP-GEF.

The PURE has nevertheless had an important presence and visibility in front of the GoG with their participation in forums, meetings and initiatives which is considered a strategic position to encourage and promote RE in Guatemala.

The socio-cultural, political, regulatory, institutional and economic environments of the project were manifested in analyzing *risk factors* that were identified by the project:

- Social participation:
 - Political instability due to unmet social demands affects community participation processes.
 - Divided leadership, social fragmentation and weak business climate as an obstacle for investment and loans in that area.
 - For these risks, mitigation measures were not presented, but in practice FUNSOLAR involvement with stakeholders of projects in rural areas has been the determining factor that has allowed the achievement of results.
- Political-regulatory, institutional
 - Political changes shifting government priorities to areas other than the project's objectives.
 - Contributions of the MEM / INDE that could deviate toward usual users connected to the network. This risk was considered minimal by affirming that funding was guaranteed, which was not correct because the resources initially compromised were not provided even if a share of resources from these institutions was finally achieved but not in the initial amount.
 - The MAGA was (and is still) committed to reducing vulnerability in selected watersheds. Given the current level of support channeled through the MAGA to address this problem, this risk is minimal. With resources compromised according to PRODOC occurred as with those committed by the MEM / INDE.

With regard to the resources initially compromised by the institutions of the GoG, it is clear that while the letters of intent were signed, they will not insure provision of resources because the mechanism in state institutions is that project formulation by the institution and its inclusion in the budget itself is required, a process that cannot be circumvented with a letter from a high official. But also the continuity of government officials involved with the project initially was lost as these were replaced because the project went through two changes of government.

However there was a risk that should be considered and taken into account in future GEF projects: The implementing agency may suffer internal instabilities that can lead to project failure. Fortunately for the project, this situation was effectively dealt by FUNSOLAR.

Project *components* and activities proposed to achieve the objectives are appropriate and responsive to the institutional, legal and regulatory framework of the project. Schedules resulting from the activities and their interrelationship in time can hardly anticipate delays that can occur but that is where the project should adapt to these situations in favor of the project's execution. The proposed schedule in

the PRODOC is extraordinarily detailed³⁴ (19 pages long) not contemplating any deficiency or delay in its implementation and clearly establishing a critical path for the project.

In this context it is necessary to note that the initial schedule of activities for four years is too tight for the project and it is considered that the runtime should have been higher given the ambitious goals and results mainly 1 and 2.

The proposed indicators were defined for the Project Development Objective and for each of the expected results for the nine components. Indicators are useful to guide project implementation and measure progress, but several indicators deserve comment, namely³⁵:

• Environmental Global Objective: Reduce GHG emissions in Guatemala through the dissemination of productive uses of RE with strong rural development benefits.

Indicator 1 description: Reduce direct emissions due to GHG as diesel replacement. **Initial Indicator:** 1.75 Mt CO₂

Modified indicator (after Substantive Review): 1.75 Mt CO₂ in a horizon of 20 years.

Observation: It is considered that the indicator was successfully modified by introducing a time horizon. However, the goal is very ambitious because it requires the effective operation of a large installed capacity of MHP, as discussed below. Also should consider, according to the substantive review, the reduction in what is installed and what is projected.

Indicator 2 description: Installment of mini and micro hydroelectric plants **Initial Indicator:** Generation of 15 MW

Initial Indicator: Generation of 15 MW

Modified indicator (after Substantive Review): Remained the same.

Observation It is recommended to evaluate how many were under construction, constructed and identified, and in management process. It is considered, however, that the goal is certainly very high especially if one considers that the MHP have small capacities and so many of them should be developed.

Indicator 4 description: Development of added value productive chains (coffee, cardamom, sustainable wood)

Initial Indicator: At least 6 developed productive chains.

Modified indicator (after Substantive Review): Besides previously mentioned cases, look for other two projects not associated with hydroelectricity use.

Observation: It is considered that the indicator was correctly modified to include other projects with results on the short term such as bio digesters and efficient stoves.

Indicator 7 description: PURE presentation to current and potential stakeholders. **Modified indicator (after Substantive Review):** Document created for potential partnerships and its objective.

Observation: It is considered to be more an activity than an indicator.

 ³⁴ Presents the activities on a monthly basis and it extended for 19 pages in the PRODOC (from page 133 to 152).
 ³⁵ Project Planning Matrix, PRODOC, page 53

Outcome 1.³⁶ Development of 1.5 MW off-grid RET (micro hydroelectric plants for productive uses)

Indicator 9 description: Development of 1.5 MW through off-grid MHP.

Initial Indicator: 1.5 MW in 11 places and proper management of plant management systems.

Modified Indicator (After Substantive Review): The same

Observation: Advance in 11 projected sites of MHP in all the community management and actions as well as the management of the financing sources, in an initial horizon of 4 years, are an ambitious challenge.

Outcome 2.³⁵ Development of a 13.5 MW and promotion of grid-connected RET (mini hydropower: MHP)

Indicator 14 description: Development of 1.5 MW through MHP isolated from the grid.

Initial indicator: 1.5 MW in 11 sites and proper management of the plant management systems.

Modified Indicator (after Substantive Review): The same.

Observation: Advance in 11 projected sites of MHP in all the community management and actions as well as the management of the financing sources, in an initial horizon of 4 years, are an ambitious challenge.

The project presents in its formulation the following weaknesses of estimation, design and programming:

- They overestimated the magnitude of the power and number of projects with MHP (indicators 2 and 9) supposing that the financial resources for implementation of both the public and private sectors and donations for the project would be obtained quickly and timely.
- The non-opportunity of resource availability resulted in the initial start-up of 3 MHP in late July 2012, and secondly, that the productive uses begin to be implemented only when the project is finished (although that diagnoses identifying opportunities if timely made), having affected the project schedule. Therefore, there has been no time to have a clear demonstration that the productive uses of energy do produce the estimated benefits and above all, ensure the sustainability of projects.
- On the other hand, it was also overestimated the real possibility of private sector participation in the development of 13.5 MW in MHP by different barriers if were identified but whose removal, despite the good efforts of FUNSOLAR, is beyond the scope of their efforts, such as the lack of adequate incentives for the development of projects and other barriers, or perceived barriers to private sector.
- Fortunately for the future of the project, FUNSOLAR searched extensively and has established partnerships with other institutions and organizations that will accompany these projects and will enable them to consolidate production chains probably already underway.

³⁶ The notation of Substantive Review (SR) has a Global Environmental goal and four (large) Results. This will have a total of 22 project indicators.

Therefore, the evaluator considers that the Project formulation is *Moderately Satisfactory (MS)*.

3.1.2 Relevance of the Project for the country / country ownership

Given the historical background of national public policies of the REP trying to overcome poverty and climate policy, *the project was relevant to the country* because it favored the penetration of RE technology by offering to valid technical, economic and environmental options for the development of rural areas of the country.

In addition to the high relevance of the project for the country, the project has not only reached the achievements that are discussed below, but *has managed to position the RET in the Ministry of Energy and Mines, other ministries (MAGA, MARN), in municipal governments, but especially in rural communities and their organizations, as a valid and sustainable option for electrification and rural energy. This situation has been highlighted during the evaluator's visit to the projects implemented in the regions of San Marcos, Alta Verapaz, Baja Verapaz Izabal³⁷, and the interviews with both project beneficiaries and with community organizations and some authorities, which is an indicator of the ownership of projects with RET by these actors. In addition, the project actors have taken a different degree of knowledge of technology, project management, the development of mechanisms for sustainability, so these players have been able to verify the suitability and the difficulties of the projects RET for the country.*

The degree of participation of the actors that was reached during this process of appropriation was high. The project has interacted with all previous institutions to coordinate activities during the five years of implementation. To perform the tasks, the project has had to create support networks, consensus and awareness of RETs, mainly technical and create policies to implement projects and seek to meet the project objectives.

3.1.3 Actors' participation in conceptualization / Project design

The two institutions (FUNSOLAR and UNDP) previously worked on Medium Size project that produced, along with the results of other projects implemented by FUNSOLAR, the basic information for the development of the PDF-B. With regard of the interaction with other actors in the government sector, there was interaction at the highest level in the discussion of the project objectives, its scope and the roles of these institutions in the project, and is a clear demonstration of the ability of FUNSOLAR to propose actions at the highest level. And because of its proximity to the rural sector, project beneficiaries and local authorities were very close to FUNSOLAR for their ongoing work with communities and organizations in the area of influence.

There was good participation of different actors in the conceptualization and design of the project led by UNDP and FUNSOLAR; due to the deep knowledge of the rural sector by FUNSOLAR and the summoning power of UNDP to Guatemalan institutions around an issue of national interest in line with government policies.

³⁷Izabal, which is not within the area of influence of the project, however it is close to some municipalities that are within (Chahal, Panzos department of Alta Verapaz), was considered and improved stoves were implemented.

3.1.4 Project follow-up, Monitoring and Project management

The evaluator has found as a result of dialogue and the interviews with different actors of the project, an active participation of UNDP in facilitating the efforts of the project. He also observed an active monitoring and tracking of the same which has resulted in the qualifications given to the project in the PIR that help the project actors to identify deficiencies in project implementation and establish appropriate corrective measures. On the other hand, in reference to FUNSOLAR, noteworthy is the adoption of appropriate and timely actions to resolve the problems of qualified personnel presented during the 2009 - 2010 restructuring, and had that not occurred the project most likely would have failed. Noteworthy was the following, monitoring and project management by UNDP, FUNSOLAR and other actors of the project which was able to conduct the substantive review in March 2011 that allowed the project to reorient and focus during the end.

3.1.5 Other issues

For the implementation of projects, UNDP has the advantage over other institutions, its enormous convening power against the state sector and the unions, and society in general. On the other hand, manages lines of social and government interest related with the GoG. Also, their recognized impartiality is favorable when operating with multiple actors.

3.2 **PROJECT IMPLEMENTATION**

3.2.1 Implementation Approach

The implementation approach was simple and transparent. FUNSOLAR as Executing Agency was responsible for appointing within their personnel a Project Coordinator. The UNDP hired an International Technical Advisor. It also established a Project Steering Committee. All these positions with the functions are given in Section & 0.

The logical framework that is presented as integral part of PRODOC driveline remained throughout the implementation of the initiative, having made a Substantive Review of the project as was already discussed in Section 3.1.1 that sought to clarify the scope of the results, mainly because it was recognized that they were very ambitious and clarifying their catalytic role in the project.

The Work Plan that guided the implementation was presented in the PRODOC. This Plan was prepared and adjusted periodically to meet project implementation. The work plans for implementation were processed following the procedures of UNDP to approve the resources that would be executed each year.

Overall bilateral communication channels between one and another party were satisfactory, and no evidence to the contrary was found.

The program set out from the beginning of the ToR related with the contracts required for implementation. To run the project, various consultants and consulting firms were hired. In relation to the work of the consulting firms contracted, the evaluator found that the people or companies contracted met their deadlines and deliverables satisfactorily. Only a comment from auditors related to incomplete documentation of a consultant was submitted, a situation that was corrected by FUNSOLAR (see Section 3.2.2.4).

The PRODOC contains a logical framework consistent and coherent with the overall and specific objectives of the project but with many indicators that do not add transparency but complexity to the monitoring, following and evaluation.

Project implementation has not been done without difficulties which FUNSOLAR has been able to solve. In early 2009, FUNSOLAR suffered institutional changes that had a significant impact on the project since the Project Director retired along with qualified personnel who participated in the execution. Virtually all the staff and FUNSOLAR Board changed in 2010, and in that year the project began operating in a different institutional context established early in the project.

Institutional changes suffered by FUNSOLAR had a significant impact on the project, and resulted in little progress achieved in 2009-2010. A mid-term evaluation of two steps was conducted by two independent consultants; both agreed that the PURE project could continue operating under the restructured NGO. The UNDP followed the recommendations of the evaluators and made considerable efforts to address the challenges identified during the evaluation process. However, most of this time was devoted to restoring FUNSOLAR's project team after its disappearance in early 2009. At first it was unclear whether FUNSOLAR's restructuring could maintain the level of knowledge and experience to execute this project, and substantial reconstruction from networks and relationships, both with co-founders and communities, which had to occur for the project to be successful. While the UNDP did not question the willingness or ability of the new members of the project team, the project required strong institutional settings to achieve their goals, and FUNSOLAR must show that had the institutional strength to carry out this successful initiative management and increase in the following years until the end of the project.

During implementation of the project there has been three National Coordinators of PURE. Precisely one of the risks of the project that was not considered was the possibility that FUNSOLAR could be dismantled in terms of personnel, a situation that was overcome by FUNSOLAR.

The evaluator considers that the implementation approach is SATISFACTORY (S).

3.2.2 Monitoring and evaluation

3.2.2.1 Monitoring

The PRODOC established the following mechanisms of Monitoring and Evaluation (M&E) for the project³⁸:

- a) The M&E would be carried according to control, monitoring and evaluation procedures of UNDP in the ATLAS system. This feature would be supported by the UNDP Country Office (CO), the UNDP-GEF Regional Coordinating Unit (RCU) and UNDP Sub-Regional Resource Facility (SURF). Both the UNDP and FUNSOLAR would be jointly responsible for the continuous monitoring of the progress of the program.
- b) The Logical Framework Matrix would be the guide for evaluating the performance of the project and contains the impact indicators with their means of verification.
- c) UNDP Guatemala would monitor performance during execution.

³⁸PRODOC, Pages 48 to 52.

- d) Monitoring the day-to-day progress of implementation would be the responsibility of the Project Coordinator, based on the Annual Work Plan and its indicators of the project. The Project Team report to the UNDP CO for any delays or difficulties during implementation so that the proper support or corrective measures could be taken in a timely manner. The Project Coordinator would make internal reviews and comments on performance to provide feedback and direct efforts in the desired direction.
- e) Periodic monitoring of implementation progress will be done by the Project Coordinating Committee through monthly meetings and the UNDP CO through quarterly meetings with the Fundación Solar, or more frequently if needed.
- f) Annual monitoring would be done through the Annual Project Report (APR). The APR-PIR (Project Implementation Report) would highlight policy issues and recommendations for the decision of the PSC participants.
- g) The Project Steering Committee would meet once a year at least to check the status of the project.
- h) A Mid-Term Evaluation would be done at hallway of the project, where in addition to the financial aspects would assess compliance with expected results and activities in accordance with the objectives and work plan of the project.
- i) A final report prepared should be developed during the last three months of the project by the project team and the UNDP CO and the project consultants should summarize all activities, achievements and results, goals made (or not made) of project and the lessons learned and the structures and systems implemented. Also expose the recommendations for new measures to be taken to ensure sustainability and replicability of the Project's activities.
- j) Annual TPR meetings would be conducted assessing the project's performance.
- k) A Program Completion Report (Final Report) for consideration at the final tripartite review meeting would be written.

Table 3-2 shows received documentation related with the Project's M&E from 2007 until December 2012. From reviewing this information, the evaluator was able to infer the fulfillment of the following monitoring mechanisms:

- Monitoring mechanisms established by the UNDP have been employed.
- FUNSOLAR as executing agency has dealt with the daily work of the same using the quarterly and annual POAs.

More specifically, and related to monitoring mechanisms, in this project were developed all PIR / APR PIR / APR (PIR: UNDP GEF Project Implementation Reports and APR: UNDP Annual Project Report) Project Report) from the first to the period July 2007 - October 2008 to last for the period from July July 2011 to 30 June 2012 (see

- Table 3-3). While in 2007-2008 the qualifiers are on average Satisfactory, after the reports of 2008-2009 and 2009-2010, both assessments of objectives achievement for developing and implementing the project are around MS and MU, indicating difficulties in project implementation (low execution also affected by changes in FUINSOLAR). The need for a substantial revision of the project was identified in the RIP 2009-2010 and was held on March 31, 2011. Already in the RIP / APR for 2010-2011 and 2011-2012 it begins to improve until MS for the development goals and S for project implementation.
- Globally, project performance has been rated in the past two PIRs as MS and S for development goals and MS in both periods for the implementation of the project.
- At this point it should be stressed that following FUNSOLAR restructuring, activities increased and allowed to reach in recent years most of the project's achievements.

Category	Туре	2007	2008	2009	2010	2011	2012	Observations
	Annual PIR	NA*	Х	Х	Х	Х	Х	
1. Reports	Quarterly Progress Reports (QPR)	1	4	4	4	4	2	
	Final Project Report							Non available
2. Meetings	Tripartite meetings		1					6 March 6, 2008. Reported in PIR
	Steering Committee			1	1	2	2	
3. Operative	Quarterly Operational Plans	1	4	4	4	4	3	
Plans	Annually Operational Plans (POA)	х	х	х	х	х	х	
4 Evaluations	Mid Term Evaluation			Х				Consultant: A. Fabris
4. Evaluations	External Financial Audits		Х	Х	Х	Х		2012 Audit Pending
	Final Term Evaluation						Х	This Report
5. Project Reviews	Substantive Project Review					х		March 31, 2011

Table 3-2. Documentation about M&E (2007-2012 period)

Source: Evaluators compilation

- <u>Project Advancement Reports.</u> They consist of the APR/PIRs. There are also final reports or sub-contract products made by consultants and consulting companies.
- <u>Final Project Report.</u> The final Project Report has not been done (by December 2012)
- <u>Project Coordinating Committee Meetings</u>. Six Acts from the Coordinating Committee which correspond to meetings done at the end of 2009 until September 26, 2012 (20-nov-09, 10-nov-10, 31-mar-11, 07-dic-11, 17-abr-12, 26-sep-12) were received, but none before that. In them there are presentations of the project's development status and the current status, and there are recommended actions to redirect its course.

3.2.2.2 <u>Participation of agencies in the project</u>

This section seeks to assess the role played by other partner organizations involved in the PSC. It is based on information received from two interviews with official from NSDI, CNEE and MARN (See 6.4). These observations are:

Rating of Progress Towards Meeting Development Objective (DO)									
Period	National Project Manager/ Coordinator	UNDP Country Office Programme Officer	GEF Operational Focal Point	UNDP Technical Advisor	Global Rating				
2007-2008	S	S		S					
2008-2009	HS	S		MS					
2009-2010	MS	MU	MS	MU					
2010 - 2011	HS	MS	HS	MS	MS				
2011- 2012	S	S		S	S				
	Rating of I	mplementation	Progress						
			-						

Table 3-3. Assessment qualifications of the Project execution according to the PIR

Rating of Implementation Progress										
Period	National Project Manager/ Coordinator	UNDP Country Office Programme Officer	GEF Operational Focal Point	UNDP Technical Advisor	Global Rating					
2007-2008	S									
2008-2009	S	MU		MS						
2009-2010	S	MU		MU						
2010 - 2011	S	MS		MS	MS					
2011- 2012	S	MS		MS	MS					
Source: Prepared by Consultant										

Source. Frepared by Consultant

- There has been a deficiency in the participation of the governmental agencies as a result of change in the institutions from government (during the execution of the project there has been two changes of government) and monitoring the project was affected by it.
- The project had an interim due to the change of FUNSOLAR's direction which is considered to have affected the project significantly by questioning the continuity of FUNSOLAR's capacity in project implementation.
- The GEF is a leveraged fund and there were no serious commitments by financing agencies initially pledged.
- Some government agencies showed to the project evaluator the weakness of the communication with FUNSOLAR. FUNSOLAR have lacked information to all stakeholders.
- According to the MARN, implementing agencies consider it only as a stage in the proceedings before the GEF and according to them, including the MARN missed the window of opportunity.

3.2.2.3 <u>Mid-Term Evaluation</u>

The program had a mid-term evaluation planned which was conducted in December 2009 by A. Fabris³⁹. This evaluation considered to change the project results` scope of and established a number of recommendations, among which are:

³⁹ Fabris, A. (2009). <u>Evaluación de Mediano Término</u>. UNDP-GEF. Ciudad de Guatemala

Outcome 1.

- Take as an example the handling that is given to the Chel central to replicate it in other developments.
- It is recommended in the development of projects to go only prefeasibility because projects developers are reluctant to accept feasibility studies conducted by a third party.
- Recommends to promote water supply of communities as a side effect
- Introduce improved stoves

Outcome 2.

• He recognizes the difficulties of developing interconnected projects with the private sector. This is a correct perception of the evaluator.

Outcome 4.

• The PURE should focus their efforts on studying the policy and regulatory barriers that could promote productive uses with RET.

Outcome 5.

- The project has too many activities and the Mid Term evaluator conceptualizes that they will not manage to achieve the expected results.
- It should be reconsidered the role of the project committee to facilitate the participation of other organizations involved in the project and make it operational.
- A project review is recommended, which resulted in the Substantive Review in 2011. It was also recommended an extension of the project, which was achieved for one year.
- The project should make more web presence. A valid recommendation.

The evaluator considers as very valid the recommendations of the mid-term evaluation and its implications for the final execution.

3.2.2.4 External Financial Auditing

All financial management and supporting documentation relevant was handled by UNDP-Guatemala. The UNDP hired external financial / accounting audits with specialized firms. These included reviewing the DCRs (Delivered Combined Report), operating procedures used by the project, according to the provisions of the UNDP, and the internal control environment.

According to external audits of the program⁴⁰, the implementation of the project was rated as medium risk, due to the fact that according to the Auditors there was a chance that many of the internal controls for making payments or procedures did not comply strictly with the procedures of UNDP. There were reports of four external audits (2008, 2009, 20010 and 2011). In the 2008 audit report six accounting findings were presented (only one of medium risk) that were reported in the audit of 2009 as corrected. The audit of 2011 has four internal control observations of the project, two of high risk (insufficient review of settlement costs and breach of rules of the manual project management), which should lead to observations in the last audit report of 2012 coming to fruition.

⁴⁰ 2008, 2009, 2010 Auditing made by Manuel Cervantes & Asociados S.C. 2011 Auditing was made by Amory González, C.P.A.

The evaluator considers that a systematic following to the advancement of activities was given and considers therefore that the monitoring and following of the Project is *Satisfactory* (S).

3.2.3 Financial Planning

The project was carried out according to the method of "national execution by NGO – CSO execution)", whereby transactions, contracts and disbursements necessary to implement the project are authorized by FUNSOLAR, but are reviewed by UNDP.

In relation to the financial performance of the project, according to the PIR of June 30, 2012, the GEF had provided US\$2,296,982 to the project. A more recent report of FUNSOLAR gives the sum of US\$2,514,162 as executed by November 30, 2012. According to the above, the degree of execution now reaches 99%.

3.2.3.1 Investment Amount, Co-Financing and GEF Leverage factor

According to the PRODOC the initial project budget is US\$14.05 million, not including the formulation cost of the PDF-B which amounted to US\$278,000. Of these, the GoG would provide USS \$10.5 million, 75% of project resources, through MAGA (US\$8,000,000), MEM (US\$1,000,000) and the municipalities (US\$1,000,000), all of the above in cash and US\$500,000 in kind (Table 3-4). The contribution 'Others' are US\$1,000,000 from the Association of Renewable Energy Generators (AGER), of private character.

				PURE I	NITIAI	L FUNE	S			
Type of funds	UNDP / GEF Funds (US\$)		Government (US\$)		FUNSOLAR (US\$)		Other (US\$)		Total (US\$)	
/ Co-financing										
	Provided	Disbursed	Provided	Disbursed	Provided	Disbursed	Provided	Disbursed	Provided	Disbursed
Grants	\$2,550,000	2,499,003.67	\$10,000,000				\$1,000,000	\$0		
Loans										
· In-kind			\$500,000							
· Otros										
Totals	\$2,550,000	\$2,499,004	\$10,500,000	\$0	\$0	\$0	\$1,000,000	\$0	\$14,050,000	\$2,499,004

 Table 3-4. Funds provided according to PRODOC and disbursed at December 2012

Source: PRODOC and FUNSOLAR information.

Initial resources from the GoG for PRODOC were established by letters of co-financing of the various ministries involved but were not implemented during project implementation. In addition, in-kind donation was not clearly identified on how it would become effective. Neither was the contribution of US\$ 1,000,000 from the AGER effective.

During project implementation, resources were searched again with the same ministries and other agencies of GoG or through which efforts were made to obtain resources from other institutions (MAGA, FONADES, INDE, CNEE, Universidad San Carlos de Guatemala),by an expected value of \$5,827,800, of which up to 28 November 2012 US\$637,800 had been cleared (Table 3-5). The loan is

for \$20,000 from the CNEE for the revolving fund of efficient stoves. The largest amount contributed by the government has been the tax exemption of imported equipment for three MHPMHP plants built by Japan International Cooperation Agency (JICA) for a value of \$1,446,624.

In addition resources with other agencies (MIF, JICA, Global Clearinghouse, Hidroxacbal, Alliance Energy and Environment, Avina Foundation, Church of Norway, Organization of American States) were sought for a value of \$20,946,785, of which concrete US\$17,096,785 were achieved. The greatest contribution corresponds to the direct donation of JICA to GoG for \$15.175 million, of which US\$12 million were used to construct the three MHP and the rest were for cooperation assistance. The resources of this grant were not handled by FUNSOLAR but directly by JICA but were executed in the context of the project and benefited the PURE. The FUNSOLAR partner provided US\$ 175,000 in kind.

By December, 2012, the project has still available for execution US200,996.33, of which US50,996.33 come from the GEF, US100,000 from the Agency Energy and Environment, and 50,000 from a project to support communities funded by the OAS and starting in December 2012^{41} .

⁴¹ The project started February 2013.

Figure 3-1 below shows the funds provided for the project according to the PRODOC and its execution at present, and the new funds managed during implementation of the project and its current state. As yet only remaining US\$ 185.838, it means that many of the proposals made during the project were not paid, such as the proposal made through the GoG (INDE) to the IDB for US\$ 5,000,000.

	PURE ADDITIONAL FUNDS											
Type of funds /	Government (US\$) - (Additional to initial funds)		Other Agencies / NGOs		FUNSOLAR		Total					
Co-infancing	(11001010100	, , , , , , , , , , , , , , , , , , , ,	(US\$)		(US\$)		(US\$)					
	Provided	Disbursed	Provided	Disbursed	Provided	Disbursed	Provided	Disbursed				
Grants	\$5,827,800	\$637,800	\$20,946,785	\$17,096,785								
Loans (revolving fund)	\$20,000	\$20,000										
· In-kind	\$162,500	\$162,500			\$175,000	\$175,000						
• Other (tax exemptions to JICA MHP	\$1,446,624	\$1,446,624										
Totals	\$7,456,924	\$2,266,924	\$20,946,785	\$17,096,785	\$175,000	\$175,000	\$28,578,709	\$19,538,709				

Table 3-5. Additional funds for the PURE Projects

Source: Information from FUNSOLAR

To summarize, the project has so far mobilized resources for \$ 22,052,871.48 (US\$ 185,838 still left to execute). It is important to note that the co-financing from other organizations was managed directly by them and FUNSOLAR only executed GEF resources.





Source: Information from FUNSOLAR

The table below (Table 3-6) shows the nominal resources which include new requested resources, not granted resources according to PRODOC commitments and rejected applications in the search for new resources, the available resources for the project and the executed resources and still waiting to be executed by November 28, 2012.

Table 3-0. Froject resources summary	Table	3-6.	Projec	t resources	summarv
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Fund Source /	Nominal amount of funds	Funds no granted Funds available -		Up to November 28, 2012		
Amounts		runus no granicu	r unus avanabic	Disbursed	Remaining Funds	
PRODOC	\$14,050,000.00	\$11,500,000.00	\$2,550,000.00	\$2,514,162.00	\$35,838.00	
New Funds	\$28,578,709.48	\$8,890,000.00	\$19,688,709.48	\$19,538,709.48	\$150,000.00	
Totals	\$42,628,709.48	\$20,390,000.00	\$22,238,709.48	\$22,052,871.48	\$185,838.00	
Consolidated: Exe	cuted+ Remaining =	\$22,238,709.48				

The **leverage level** achieved in the project is **8.7** for the GEF (quotient between \$ 22,238,709 and \$ 2,550,000), which the evaluator considers *Highly Satisfactory* (*HS*).

The external audits done in the Project, as it was previously mentioned, are clean and without any exceptions (Section 3.2.2.4). That indicated that there has been good care in the GEF resource management.

3.2.4 Replicability

The project has produced an important legacy of different kinds of information such as diagnoses in communities on productive uses, training methodologies, a methodology called PURE Working Model, good practice manuals, systematization of lessons learned, etc. All this information is found mainly in FUNSOLAR and should be made accessible to other actors in Guatemala. In this sense, the MT assessor had considered the potential of the web to distribute this information.

It has been also shown that MHP projects in projects not interconnected to the network have quite high costs (especially those implemented by JICA) so that increasing the coverage of electricity is very expensive at such costs. The replicability of projects of efficient stoves and biogas plants as RET is evident; if one considers that the work of PURE *is a very solid base that will replicate projects* in Guatemala.

3.2.5 **Project effectiveness**

The emissions reductions achieved are well below the targets of results 1 and 2, only at the end of the program the productive uses will start in some cases and a moderate effect of the project on barriers are ends result of the project, on one hand. On the other hand, the work done on sustainable management of natural resources and energy in river basins is appreciable, a moderate advance in the socio-political aspects and institutional framework was achieved, and a great job on capacity building was done.

It is considered that the project reached some of the environmental objectives and is considered in terms of effectiveness, *Moderately Unsatisfactory (MU)*.

3.2.6 Cost-Effectiveness of the project

Taking into account the cost of the GEF investment, had it reached 100% of the target of 1.75 million of t CO_2 avoided, the cost to the GEF would have been US\$ 1.45 / t CO_2 . When having achieved to date only a reduction of 13% (see Section 3.3.1) the cost is US\$ 11.09 / t CO_2 avoided (Table 3-7).

Now if we consider the possibility that in a horizon of five years 50% of projects with feasibility are implemented and massively efficient stoves and biogas plants are introduced, the cost to the GEF would be US\$ 1.65 / t CO_2 avoided. This scenario is one optimistic considering FUNSOLAR's future perspective of activities in its commitment to the rural sector.

With regard to the relationship between the contribution of the GEF and the amount of resources mobilized, the project has had a high leverage factor of 8.7 which shows the project's efficiency in resource mobilization.

Catagony	Avoided Emissions	GEF Unit Cost	
Category	(tCO2)	(US\$/t CO2)	
GOAL	1,752,613	1.45	
Identified	6,188,713	0.41	
With Pre-feasibility	2,622,875	0.97	
Implemented	229,936	11.09	
Optimistic Scenario:			
Implemented + 50% With	1 641 274	1 65	
Pre-feasibility	1,341,374	1.65	

Table 3-7. Cost of emission reduction for the GEF

While the cost to the GEF of reducing emissions is six times higher than originally estimated, in an optimistic scenario of development of the project to be implemented then a fraction of about 25% of those with pre-feasibility and use emission reduction technologies proven very cost efficient in the project (efficient stoves and biogas plants), it can be considered that the efficiency of the project is *Moderately Satisfactory (MS)*.

3.2.7 Sustainability

The objective of this section is to assess the measure in which the Project benefits will continue in and out of the project's domains after it has concluded.

3.2.7.1 <u>Development of Technical Capacity</u>

As stated in the PRODOC, the project developed several components that have left an important capability since they all have had a strong emphasis on training. This technical training has been seen primarily in FUNSOLAR staff, beneficiaries and other stakeholders involved in the PURE. This developed capacity will be used with certainty by FUNSOLAR in PURE continuity supported by other agencies and institutions, which will benefit the development of rural communities.

Again, there is a need to make available to other governmental, private, social organizations and the general public all the comprehensive information produced by the project.

3.2.7.2 <u>RET Appropriation</u>

In the implemented projects, for example in MHP in operation, biogas plants, users of improved stoves, the beneficiaries of watershed conservation projects and micro enterprises, they have proved the excellence of the technologies and constitute show-cases of them, having taken up the RETs. Similarly social organizations, local authorities and community development organizations, have found these projects demonstrating the benefits of the RET projects executed thus becoming RET promotion points.

3.2.7.3 Development of Institutional Capacity

The biggest beneficiary in terms of institutional capacity development has been FUNSOLAR. They have received the direct benefit of the project and the institution has qualified personnel, information and the methodologies developed by the project to ensure continuity in the use of RETs with work

experience that FUNSOLAR has been institutionally strengthened for future projects with RETs. Other beneficiaries are local associations that have been strengthened.

3.2.7.4 Financial Sustainability of the Implemented Projects

There are two categories of implemented projects to consider: Projects with biogas plants (biodigesters) and improved stoves that have had the acceptance of the beneficiaries and the results have been so positive that sustainability is hardly questionable.

Projects with MHP have the problem that the productive use projects have not been implemented and the energy demand is very low, hoping to increase it to raise income. Make the microenterprises sustainable and *beyond, capitalize resources to ensure preventive and corrective maintenance costs, it is urgent to ensure the sustainability of these MHP.*

When considering projects implemented, it shows that the productive uses electricity (isolated and connected to the grid) face high challenges to ensure the financial sustainability of these projects. It then considers the sustainability of the project is *Moderately Unlikely (MU*).

3.2.8 Impacts

It is advisable to keep in mind that the impacts at global environmental level would be visible in the emissions reduced by the project by the behavioral change of beneficiaries in the conservation of watersheds and the adoption of practices and technologies that reduce carbon emissions. While reduced emissions are minimal with respect to the goals, the changes that have occurred among rural beneficiaries are significant.

3.2.9 Execution and implementation Modalities

The evaluator considers that the UNDP Guatemala:

- *Effectively supported* the selection, recruitment, assignment of experts and consultants, and national counterparts in the definition of tasks and responsibilities.
- Led together with the UNDP Regional Office in Panama the consultation process for the approval of contracts.
- *Conducted the timely payment arrangements* relating to fees and services that were hired by FUNSOLAR.
- In relation to the review of the products derived from consulting it did not issue evaluations of their quality.

In terms of effectively communicating procedures or responses to queries made to the executing agency, UNDP proceeded doing the necessary arrangements, for example, for the substantive review of the project. This took place on March 31, 2011, with the participation of officials from UNDP Guatemala (Program, Monitoring and Evaluation Officers), UNDP Regional Technical Advisor and FUNSOLAR officials participating in the PURE (Project Coordinator, Coordinators of Natural Resources, social component, management and advocacy, and Planning and Monitoring).

The substantive review responded to the FUNSOLAR concern that some indicators of the project were too ambitious for the short time of project execution and the short time remaining (until the end of 2011). This concern from FUNSOLAR arose from a reassessment of the logical framework by FUNSOLAR coordinators who described the achievable goal in 2011 and what would be attained when obtaining an extension of time limit for completion until late 2012. As a basis for substantive review, the original PRODOC log frame in English and the PIR of July 30, 2010 was used.

As a result the indicators were readjusted and are these that will be used in this evaluation finally.

Meetings were held, as indicated earlier in this report, and they acknowledge that the participation of UNDP in relation to the quantity, quality and timeliness of inputs regarding their responsibilities for implementing the project, remained steadily.

The availability of funds was in line with the needs of the project, namely the provision of resources for timely payments was "following the due process requests for payment."

3.3 **RESULTS**

Below, the achieved goals related to the Global Environmental Objective of the Project are analyzed, using the proposed indicators and the verification sources described in the PRODOC in the version that resulted from the Substantive review of March 2011 as criteria.

3.3.1 Global Environmental Objective

The Global Environmental Objective is to reduce GHG emissions through dissemination of renewable energy for productive uses in conjunction with strong rural development benefits. The indicators for the achievement of this goal are 8 (see Table 3-8). The table shows the original goals and the revised goals of the indicator according to the Substantive Review of the project.

Indicator	Goal at the end of the Project	Goal at the end of the Project	Observations
	(original)	(revised)	
1. Reduction of	1.75 million	1.75 million t	The goal by the end of the project is
direct emissions	t of CO2	of CO2 in 20	incorrect. This emissions reduction was
due to the use of		years	projected by 20 years. By reporting this it
MHPMHP as		-	should state: installed capacity, projected
Diesel			capacity and what does this mean in terms
replacement.			of emissions reduction. Also measure
			what is under construction up to the date
			of project closure, how this translates in
			CO2 emission reduction by year.
2. Installment of	15 MW	Remains the same	The goal does not change, report: how
mini and micro			many kW are under construction, how
hydroelectric			many are built, how many are identified
plants.			and in the process of management or the
-			advancement of the efforts made for how
			many kW and that will be the total
			advancement for15MW. Successful
			examples were the improvement of the

	Goal at the end of	Goal at the end of				
Indicator	the Project (original)	the Project (revised)	Observations			
			relations between communities and project developers are also measured Execution, projection and commitments.			
3.Direct and indirect reduction of emissions		7 million t of CO2	Also measure what is in process of building by the closure of the project, how this translates in reduction of CO2 emissions by year.			
4.Development of Productive Uses of Energy (PUE)	At least six productive chains of added value developed (example: Coffee, cardamom, ecotourism, sustainable wood)	At least six productive chains of added value developed (ex: Coffee, cardamom, ecotourism, sustainable wood) related to hydroelectricity and two others not	Manage a couple of examples not related to the use of hydroelectricity - investment could come from the Project for pilot projects, business models that are not for the long-term. These examples could be bio digesters, efficient (saving) stoves, etc.			
5. Income increases (distributed in an equal manner between men and women) due to the use of renewable energy.	10% increase in income in the communities where the project has intervened.		Measuring the increasing percentage is difficult. However, what could be measured is the change, from energy substitutes to renewable energy use. Also that the PUE that is promoted reflects a significant income or that demonstrates that the gap between men and women is closing. Document if there has been and income and how this income is distributed between men and women.			
6.Project Management	Project Management Unit y current Accompanying Committee	Remains the same	However, the Accompanying Committee has to be reactivated and keep active and frequent contact so that it is transparent to government changes, etc. and for that it is necessary to document what is currently being done.			
7. PURE presentation to current and potential shareholders	N.A	Document the number of created or potential partnerships and the purpose of these partnerships	This is more an activity than an indicator.			
8.Strategic Partnerships made	N.A	Document the number of created or potential partnerships and the purpose of these partnerships.	The partnerships that are established have to contribute to reach the goal: What is obtained with the partnership and how the partnership is sustainable. Make categories for the partnerships: Generation, government issues, etc.			

The Project Development Objective was the reduction of CO2 emissions resulting from electricity generation (replacing diesel) in a 20-year horizon in 1.75Mt CO2. The methodology used in this evaluation to calculate the avoided emissions follows the PRODOC and uses emission factors for MHP and other factors, as given below. The calculation is as follows:

EmEv (tCO2) = *EG (energy/year)* 20 years *CEmEv (tCO2/energy unit), where:

- EmEv : Avoided Emissions
- EG : Generated Energy = Power * Capacity Factor * 8760 hours/year
- CF: Capacity Factor: Percentage of operation of the plant at full capacity, and
- Emissions Coefficient: CEmEv (tCO2/energy unit): CO2 emissions equivalent avoided by unit of generated energy.

The following table shows the reduced emissions emission coefficients including those of different technologies that the MHP used in the $project^{42}$.

Technology	Magnitude	Unit	Capacity Factor	Source
MHP off-grid	2.070	tCO2/MWh	30%	PRODOC
MHP grid connected	0.840	tCO2/MWh	80%	PRODOC
Pico Hydropower Plants	2.070	tCO2/MWh	30%	Supuesto
PV Systems off-grid	0.670	tCO2/MWh	20%	Green Development
Fire-wood	20.313	tCO2/año		Green Development
Biogas	0.037	tCO2/m3		Green Development

 Table 3-9. CO2 Emission coefficients for different technologies

Table 3-10 shows the reduced emissions according to the stage of development of the project and depending on whether the systems are connected to the grid or not. As shown, the project in terms of emission reductions by the *implemented projects achieved 13% of the goal*. If projects with prefeasibility were developed, these would correspond to 150% of the goal, and if the identified ones were developed, these would correspond to 353% of the target additionally.

It is important to note the great importance of avoided emissions due to the implementation of the efficient stoves and the use of biogas plants.

⁴² The peak plants have been considered with an emissions level equal to those of MHP outside the network.

In relation to the efficient stoves, the regular wood stoves emissions have been used to estimate $0.47 \text{ tCO}_2/\text{year}$ by Green Development (company hired by FUNSOLAR to estimate emission reductions) and the avoided by the use of efficient stoves are those that correspond to 2/3 of wood savings, 20.31 tCO₂/year.

In the case of photovoltaic systems, the value of 0.67 tCO_2/MWh has been taken estimated by Green Development.

In reference to the biogas plants, it is estimated that the CO_2 emission coefficient correspond to 1.29 t CO_2 / year for a consumption of 660 m³ of biogas per year. Given that the methane emissions factor produced by the organic waste decomposition is 21 times higher than the CO_2 , then the avoided emissions correspond to 0.039 t CO_2 avoided/m³. The small plants have a production capacity of 4.5 m³/day and the big ones of 22.5 m³/day.

Off-grid												
T a alamata ang	Goal		Identified		With Pre-feasibility			Implemented				
rechnology	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)
MHP	11	1500	163,199	16	25120.5	2,733,090	7	1543	167,877	4	416	45,260
Pico - Hydropower										3	0.9	98
PV Systems										6	0.72	78
Small bio-digesters										7	*	8,524
Eco-Tourism										1	*	1,218
Efficient Fire-wood												
Stoves										430	*	174,695
Totals	11	1500	163,199	16	25,121	2,733,090	7	1,543	167,877	451	418	229,873
Connected to the gri	d											
		Goal			Identified		Wit	h Pre-feasibil	lity		Implement	ed
Technology	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)	Number of Projects	Power (kW)	Emissions (tCO2)
MHP	13	13,500	1,589,414	26	29351	3,455,622	7	20852	2,454,998	0	0	0
Solar Pumpings										2	0.46	50
PV Systems										1	0.12	13
Totals	13	13,500	1,589,414	26	29,351	3,455,622	7	20,852	2,454,998	3	1	63

Table 3-10. CO2 Reduced emissions according to the projects' development degree

Table 3-11. Reduced emissions by the project's developmentstage

Catagony	Grid Connected Off-grid		Total	Relativ to GOAL	
Category	(t CO2)	(t CO2)	(t CO2)	(%)	
GOAL	1,589,414	163,199	1,752,613	100%	
Identified	3,455,622	2,733,090	6,188,713	353%	
With Pre-feasibility	2,454,998	167,877	2,622,875	150%	
Implemented	63	229,873	229,936	13%	

Figure 3-2 Reduced emissions by project's development stage



As verification sources of the achievements of the project's global objective, according to the PRODOC, the project reports, national communications and the official statistics should be considered. The evaluator has used the information on implemented projects given by FUNSOLAR.

In relation to Indicator 2, the development of 15MW, see Sections 3.3.2 y 3.3.3.

In relation to indicator 3, the indirect emissions, the expected ones correspond exactly to 4 times the executed ones. Given that the emission reduction will reach in 20 years with the implemented projects $230,000 \text{ t } \text{CO}_2$, the indirect emissions will reach 920,000 t CO_2 .

An extremely important aspect is the development of productive projects (indicator 4). The evaluator found evidence of efforts to promote productive projects in ecotourism (biogas plant of 50 m3), rearing and fattening of chickens (with biogas plants), food processing (with firewood efficient stoves), but not in the projects initially proposed as coffee, cardamom or sustainable wood. It is noted that the latter projects depended on power supply and therefore, having hydropower plants put into operation only at the end of the project, these PEU have not been implemented so far.

Increased income (indicator 5) and equal distribution between men and women has not been documented by the project. But what if it has been evident is that the use of biogas and efficient stoves not only improve the family income (by reducing expenses) but mainly benefits women working in the kitchen decreasing working time and reducing the impact of the products of combustion stoves in their health.

The accompanying committee (or PSC) developed its manual and held two meetings in 2008, one in 2009 and another in 2010. This committee at the date of the substantive review (March 2011) was considered necessary to reactivate (Indicator 6) and indeed in the past two years held four meetings.

In reference to PURE presentations there is no relation between the number of presentations made and to which audiences they were made (Indicator 7). What is known is that FUNSOLAR is very active on these issues and as a national benchmark in this area, is frequently invited to make presentations.

Finally, as it relates to developed strategic partnerships and agreements (indicator 8), FUNSOLAR made agreements with all beneficiaries of projects to advance the projects and be able to provide goods and services. While no relation available, the evaluator visited associations and municipalities that made the following agreements:

- Association for the development of Las Mascaritas Fall ASODICMA- Place: Xeúl Canchel, Municipality of Cubulco, Baja Verapaz
- Agreement with the San Marcos municipality for the promotion of programs and projects
- Agreement with the Association of Peasant Development Las Conchas (ASOCALCO) for the MHP Las Conchas Project development
- Cooperation Agreement with the Tacaná for the promotion of programs and projects of common interest.

Besides, FUNSOLAR made agreements for the execution and financing of the projects with AGER, HIVOS, JICA, FONADES (ProRural), INDE (IDB), GLOBAL CLEARING HOUSE, HIDROXACBAL, AVINA Foundation, CNEE, University of San Carlos de Guatemala, OAS, Norway Church (AIN) and Guatemalan Government Institutions.

The evaluator considers that given the results achieved and the prospect of future development in a horizon of five years, with the implementation of half of the projects feasibility studies and if programs continue to use saving stoves and biogas plants, 88% of the target to reach would be achieved. If this occurs, the evaluator considers the fulfillment of the overall objective as *Moderately Satisfactory* (*MS*).

3.3.2 <u>Outcome 1</u> Development and promotion of 1.5 MW off-grid technologies for Productive Uses of Energy (PUE)⁴³

Indicator	Goal at the end of the	Goal at the end of the	Observations		
mulcator	Project (Original)	Project (revised)	Obset vations		
9. Development of	• 1.5 MW in		Same case of indicator 2.		
1.5 MW of	approximately 11 places				
MHPMHP in the	• Appropriate				
plants outside the	management schemes				
grid (and solar	for created MHP				
energy)					
10. Development	• At least 3 productive		Same case of indicator 4		
of PURE (product	chains of added value				
1.1)	(could be more)				
	• Improvement in the				
	informal and Enterprise				
11 Financing	• At least four committed	Remains the same but	Financing schemes could be part		
schemes for	financial institutions	focus on the	of two categories: Productive		
MHPMHP and	• Financing to develop the	investment of pilot	uses of energy or energy		
PURE (products	PURE	Project and make a	generation. Define which		
1.2, 1.3, 2.1 y	• Government (MAGA)	historic recount of	schemes are applied to each		
2,2)	supporting the PURE	success cases	category. Also accounts for pilot		
. ,			projects as long as the		
			sustainability can be		
			documented. Successful and		
			unsuccessful stories should also		
			be documented for their		
			replicability.		
12. Technology	Strategy designed to	Strategy designed to	Not only the generation of		
services for	develop the MHPMHP	develop the renewable	energy, but all the RET, or in		
MHPMHP and	sector in Guatemala	energy sector	that case all the productive		
support services			the Valamboioch saymill		
(suppliers, etc.)			the Talandojoen sawinin.		
(product 1.5)	—	T			
13. Creation of	• Training of trainers	a. Training of	Capacities: technical,		
capacity	• Holistic approach for the	trainers	entrepreneurial management,		
(education, training	capacity development of	D. Hollistic approach	commercial, financial,		
and conscience	the local actors and	implemented capacity	administrative. Determine how		

⁴³PRODOC, page 17 and following

Indicator	Goal at the end of the Project (Original)	Goal at the end of the Project (revised)	Observations
creation) (products	beneficiaries	building of local	they will be measured.
1.4 and 2.1)		stake - holders and	
		beneficiaries	
		c. Management and	
		entrepreneurial skills	
		created in the	
		communities	

In relation to indicator 9, the development of 1500 kW of MHPs and solar systems, the Project identified 16 projects (in San Marcos, Baja Verapaz, Huehuetenango and Quiché) with a 25,120.50 kW capacity, developed at prefeasibility level 7 project for 1,543 kW and implemented 4 MHP with a capacity of 416 kW (Seasir, Jolom Ijix, Las Conchas and Chel), and other projects for a total of 417.62 kW (**Error! Reference source not found.**).

Technology	Goal		Identified		With Pre	-feasibility	Implemented	
	Number of Projects	Power (kW)	Number of Projects	Power (kW)	Number of Projects	Power (kW)	Number of Projects	Power (kW)
MHP	11	1500	16	25,120.50	7	1,543.00	4	416.00
Pico - Hydropower							3	0.90
PV Systems							6	0.72
Small bio-digesters								
(12 m3)							5	*
Eco-Tourism								
Biodigester (50 m3)							3	*
Efficient Fire-wood								
Stoves							430	*
Totals	11	1500	16	25,120.50	7	1,543.00	451	417.62

Table 2 12	Ducienta?	montfolion	Idontified	:th	nucleasibility	and im	nlomontod
Table 5-15	. Projects	DOFLIOHO:	identined.	with	Drefeasibility	и апо пп	Diementeu

The total cost of the investment in the four MHPs is US\$9,451,401 from which US\$ 8,563,901 corresponds to the contribution of JICA (**Error! Reference source not found.**). The total installed power in the four plants is 342 kW and the average investment cost varies between US\$ 6,339/kW for the MHP of Yalambojoch and US\$34,676/kW for the MHP of Las Conchas. It is important to note that the plants built by the Japanese cooperation are state-of-the-art but have and average cost of US\$29,318/kW, which is very high and corresponds to the quality of the construction made but prevents project replicability with resources from a developing country.

With regard to biogas plants, small biodigesters have the ability to generate 4.5 m3/day of biogas. The largest plant of the establishment of ecotourism has a production capacity of 20 m3/ day. In total, biogas plants produce about 50.5 m3/day of biogas, which corresponds to 24 pounds per day of LPG (see Sections 6.5.4 and 6.5.5).

The stove program developed with funding from CNEE-IDB has reduced firewood consumption by 2/3 of the conventional consumption and was handled as a microcredit program whereby each stove was fully paid by the user in six months-
Item \ MHP	Seasir (US\$)	Jolom Ijix (US\$)	Las Conchas (US\$)	Yalambojoch (US\$)	Subtotal (US\$)		
Civil Works	1,220,182	1,127,828	2,298,098	355,000	5,001,108		
Electro-mechanical works	757,339	808,614	961,455	221,875	2,749,283		
Distribution lines	311,585	487,052	591,748	310,625	1,701,010		
Total	2,289,106	2,423,494	3,851,301	887,500	9,451,401		
Blue: MHP built with JICA fund	ds						
Japanese Investment US\$	8,563,901						
Item \ MHP	Unit	Seasir	Jolom Ijix	Las Conchas	Yalambojoch	Total	Average
Power capacity	kW	59	98	94	91	342	85.5
Unit cost	US\$/kW	33,517	19,760	34,676	6,339		23,573

Table 3-14. Amount of investments of the 4 MHP developed by the PURE

Three Profiles of Photovoltaic Projects were also raised in communities in Alta Verapaz and Baja Verapaz where the services required by the community are established, the electricity demand and the capacity of the PV systems are calculated, and the investment amounts. These project profiles were completed in October 2011.

In reference to the implementation, the following table shows how 28% of the goal was implemented (Table 3-15), and if as discussed above, in an optimistic scenario of implementation, 50% of projects with prefeasibility will be implemented, and at the end that period near 1,170 kW would be installed which corresponds to 79% of the goal of this result.

Catagony	Off-grid	Relative to Goal		
Category	(kW)	(%)		
Goal	1,500.00	100%		
Identified	25,120.50	1675%		
With Prefeasibility	1,543.00	103%		
Implemented	417.62	28%		

Table 3-15. Off-grid Power by category

Finally in relation to indicator 9 FUNSOLAR has given business training to associations as found in MHP Las Conchas and the Association for the Development of the waterfall Las Mascaritas.

Regarding the indicator 10, the development of productive uses of energy, there have been three market studies (coffee -Jolom Ijix, Panzos, Alta Verapaz-, cardamom -Seasir, Cahabon, Alta Verapaz-, tourism -Las Conchas, Chahal, Alta Verapaz-) and two business plans (certified wood - Seasir Cahabon -, tourism - Las Conchas, Chahal, Alta Verapaz-), which are documented and structured. These studies and business plans were not implemented until the end of October 2012, mainly because the MHPs in Seasir, Jolom Ijix and Las Conchas were only put into operation in July 2012, so that the development of these Productive Uses only now has the energy needed for its implementation.

In reference to production projects of micro-enterprise type, two studies were conducted for solar pumping for Cola de Mico and Palogordo, and were installed with a total capacity of 0.46 kWp. A module for a cellphone charging micro-enterprise in the Xeúl region was installed. The facts observed

by the evaluator in this case are a high degree of community development and the operation of a wellestablished association.

The results of these studies were presented to a broad section of stakeholders (about 50) on June 17, 2008 in Ciudad de Guatemala at the seminar entitled "Lessons Learned from Rural Electrification in Isolated Areas", belonging to different government organizations and international cooperation agencies. Studies of advanced entrepreneurship were also made for Las Conchas, Chibalam and Xeul, identifying for each case entrepreneurship associations, the definition of strategic products and services, and identifying the skills needed to be strengthened.

For the development of projects of MHP (Indicator 11), it was necessary to develop agreements with funding agencies, in particular with the AEA for the amount of \$200,000 to supply electromechanical equipment for the Yalamboloch plant. FUNSOLAR participated actively in the development of the bilateral cooperation agreement between the Government of Japan - Guatemala Government (through the Ministry of Energy Mines, MEM) for the Seasir, Jolom Ijix and Las Conchas MHPs, agreement which was finally executed by JICA, the Japanese company NEWJEC and local contractors.

With regard to the indicator 12, MHP technology services, the competence of local consulting firms to conduct prefeasibility and feasibility studies has been clearly demonstrated, although in a single case a Spanish company was hired (Hidralia Energia, Las Mascaritas plant, 400 kW). Also in the development of MHPs the prefeasibility studies developed by FUNSOLAR involving national engineers were used. In the execution of civil works of these plants and the installation of the MHPs, the participation of national companies and engineers was crucial.

In the particular case of Yalamboloch also a strategy for the development of production of energy supplied by the plant has been developed. This plant is in pre-feasibility level.

And finally, for this result, significant effort in the development of capacity (indicator 13) has been made. The evaluator has found as a result of visits made to Xeul and Las Conchas the following noteworthy efforts:

- High degree of awareness of the importance of renewable energy and of the potential for income generation.
- Organization of community through partnerships, which are incorporated, they have their governing body, take the records of the meetings.
- Organization of productive microenterprises like charging of cellphones in Xeul. There the effect of training could be seen: micro structure, account books properly taken.
- An outstanding participation of women both in Xeul as Las Conchas. Approximately 20% of the participants were women and participating in various positions within community associations.

In addition to training in micro-enterprises and community organization in the places visited, courses for electricians in Jolimix, Seasir and Las Conchas were given, and a draft of a Microcredit Manual has been made by FUNSOLAR⁴⁴.

⁴⁴FUNSOLAR (September 2012) "The microcredits for renewable energy technology acquisition"- Preliminary version. Guatemala City.

In the implementation of this result we must consider the situation faced by electrification projects with RET versus grid extension. First of all, traditionally rural electrification was focused mainly on the electrification via grid extension and RET should demonstrate their technical, economic, environmental and sustainability via productive uses of energy. The PURE project had to develop a methodology for the identification and evaluation of projects, this being a very important legacy taken by FUNSOLAR and should be appropriate by the MEM and other institutions such as the Ministry of Agriculture. In addition, the project conducted an extensive field work, analysis of alternative technologies, renewable resource assessment, project and management models, providing the necessary documentation to municipalities and beneficiaries to be submitted to the funding mechanisms, often to aid agencies and foreign governments.

In this case, the Project has left a portfolio of identified projects (some of them executed), users and communities have been benefited, association management mechanisms, proved technologies, investment costs established, among others. The Project has therefore *complied with this result in a* **SATISFACTORY** (S) manner.

3.3.3 <u>Outcome 2</u>: Development of 13.5 MW of grid-connected Private Sector RET (small hydro)

Indicator	Goal at the end of the project (original)	Goal at the end of the project (revised)	Observations
14. Development of	13,5 MW in	Remains the same	Same case as indicator 2
MHP connected to	approximately 13		
the grid (product 2.1)	places		
	Agreements between		
	developers and local		
	groups		
15. PURE	Local population is	Local population benefited	How the communities will be
development	benefited from	by x, y, z PURE	benefited should be specified since
(product 2.2)	developed PURE	developed	the goal is very wide.
16. Interested and	A consult with local	A consult with local	More than the consult the topic is
committed and good	population is	population is organized	of management and agreements.
environmental	organized (taking into	(taking into account the	Measure the RET acceptance levels
practices,	account the local	local economy as well	compared to other zones where
development of	economy as well as	as the benefits of	PURE has not intervened,
MHP son medium	the benefits of	hydrographic basins	measuring through an information
scale (product 2.3)	hydrographic basins	management) through a	lifting instrument to know this, a
	management	perception survey.	perception survey. Work always
	-		based on local perceptions.

 Table 3-16. Outcome 2. Indicators, original and revised goals

In relation with this outcome and indicator 14, the development of grid connected MHP, is aimed to develop 13.5 MW in about 13 sites, seeking arrangements between developers and local groups.

The project actually reached three levels of project development: Identified, with prefeasibility and implemented (**Error! Reference source not found.**). As for the MHP none were implemented and the highest level of development was to conduct prefeasibility studies for seven projects **Error! Reference source not found.**). In the particular case of Coatán and Coatán III, in the visit and the meeting in

Tacaná the Feasibility Report became known. Prefeasibility studies correspond to the standard of such reports. Reports have completion date of November 2011. Coatán III has a total cost of Q 305,265,770 (US\$39,136,637) for an investment of US\$2.662 / kW. Although the final feasibility study probably will yield higher figures, is far from the cost of MHP like Las Conchas that had an investment cost of US\$34.676 / kW. However, the amount of investment is high so for these MHP, the Tacaná Association seeks foreign resources. Being in the resource lookup phase is clear that no agreements have been reached between the COMUDES and potential project developers which is one of the objectives of this result.

	Goal		Ide ntifie d		With Pre-feasibility		Implemented	
Technology	Number of Projects	Power (kW)						
MHP			26	29,351.00	7	20,852.00	0	0.00
Solar Pumping							2	0.46
PV Systems							1	0.12
Totals	13	13,500.00	26	29,351.00	7	20,852.00	3	0.58

Table 3-17. Project goals, identified projects, with prefeasibility and implemented

Table 3-18. MHP with prefeasibility

MHP	Capacity (kW)
Mayaguá	500
Pueblo Viejo	570
Santa Teresa I	230
Coatán	2,150
Coatán III	14,700
Corral Grande	2,479
Los Ángeles	223
Total	20,852

The following table shows the capacity of the projects. Although the goal was 13.5 MW, only 0.58 kW (0.004% of the goal!) were installed (**Error! Reference source not found.**). This figure shows that despite the efforts of FUNSOLAR the private sector did not find attractive MHP projects, although there are seven pre-feasibility studies with a potential of 20.8 MW. It is also very important to note that the nature of the projects when these are municipal seriously affects the ability to obtain long-term loans by legal constraints. Also, several projects are in land whose property is not well defined and therefore are not eligible for credit. Those interested in the development of these projects are currently seeking funding.

The project approached communities seeking to identify PURE projects (indicator 15) that benefit communities. In the information received from FUNSOLAR, entrepreneurship characterization studies for the Development Associations of Ucubujá, Village of Los Angeles and San Marcos, made by

FUNDES ⁴⁵ have been found. These studies analyze the structure of the associations, gather socioeconomic information of the communities and conclude with the identification of potentialities (for example, coffee plantations) and requirements for the development of the association and its members. Studies of this kind for Pueblo Viejo and Santa Teresa were also received.

Catagom	Grid Connected	Relative to Goa
Category	(kW)	(%)
Goal	13,500.00	100.000%
Identified	29,351.00	217.415%
With Pre-feasibility	20,852.00	154.459%
Implemented	0.58	0.004%

Table 3-19.	. Capacity of grid	l connected projects,	by category
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The evaluator considers that the achievements of this result as UNSATISFACTORY (U).

3.3.4 <u>Outcome 3</u>: Sustainable Natural and Energy Resources Management in River Basins

Table 3-20.	Outcome 3	3. I	Indicators.	original	and	revised	goals
	0						500000

Indicator	Goal at the end of the project (original)	Goal at the end of the project (revised)	Observations
17. Proper local environments for participative handling of the basins with integrated management of the natural resources for the generation of renewable energy and the aspects of vulnerability (producto3.1)	At least 7 management organizations of hydrographic basins legally established and incorporated	Remains the same	The ones that aren't able to be operatized, document the commitment made or the advancement degree to achieve the organization.
18. Sustainable management of the basins with local organizations	At least 40.000 acres are under sustainable management	Remains the same	Agreements with member institutions of the steering committee should be management to ensure the continuity to the action lines of the management plans. Use UNDP's convening power (look for alliances with other institutions, MARN, MAGA, mainly)
19. Better practices of agriculture, forestry and livestock handling (product 3.2)	n.a.	Remains the same	Same case of Indicator 18

⁴⁵ FUNDES (January 2011) "Characterization of the Entrepreneurial capacity of the Ucubuja Development Association", Aldea de Los Ángeles, San Marcos, Guatemala

In relation to basins management, 13 integrated management projects have been developed, having 7 micro basin committees created, whose plans are in execution (see **Error! Reference source not found.**) and whose members are part of the COCODES (Indicator 17).

YEAR	ACTION PLAN
2009	PLAN DE ACCIÓN MICROCUENCAS TUTZILA
2009	PLAN DE ACCIÓN MICROCUENCAS RÍO XACBAL
2009	PLAN DE ACCIÓN MICROCUENCAS RÍO CANCAB
2008	PLAN DE ACCIÓN MICROCUENCAS JOLOMIJIX
2009	PLAN DE ACCIÓN MICROCUENCAS DEL RÍO BALANYA
2008	PLAN DE ACCIÓN MICROCUENCAS CHIYU
2009	PLAN DE ACCIÓN MICROCUENCAS CHEL

Afterwards, four participative diagnoses have been developed ⁴⁶ with their respective integral management plans.

Table 3-22.	Participative	diagnoses and	Integral Ma	nagement Plans (IMP)
	1	0	0	0	

YEAR	DIAGNOSIS AND INTEGRATED MANAGEMENT PLAN
2011	Diagnóstico Participativo y PMI Chibalám
2011	Diagnóstico Participativo y PMI Santa Teresa
2011	Diagnóstico participativo y PMI Xeúl
2012	Diagnóstico participativo y PMI Yalambojoch

These action plans have the general outline of formulation of objectives, vision and mission, approach and strategy; legal basis of the committee, organization of the committee, names of the elected committee members for the period 2009 -2010, strategic action plans and conclusions, and recommendations. Also enclosed are the watershed area and its extension. The database of the watershed allows one to establish in each micro basin the name of the household head in charge of the proceedings, the water conservation actions, plant nurseries, fertilizer production, management of grains, and the extension of the property of each user to totalize the area of the watershed. The total extension of microbasins with action plans is 15,109.7 hectares, 38% of the target area of the project (Indicator 18). The project has developed a manual of watersheds conservation practices⁴⁷.

While these management plans have been made between 2008 and 2009, no consolidated assessment has been found on how all these plans have been operating and what have been the results. Reports indicate the execution of workshops such as Chimachó, Xeul and Canchel held during February 2012 on organic fertilizers, well attended by the beneficiaries.

To implement watershed management plans, alliances with three institutions have been made:

⁴⁶ The participative diagnoses of Chibalám, Xeúl and Yalambojoch were done by Servicios Integrales Agrícolas y Forestales S.A. (SIAFSA). The one from Santa Teresa by Servicios Ambientales S.A.

⁴⁷ FUNSOLAR (2012) Watershed conservation practices. City of Guatemala

- With FAO to develop four bio-digesters for lighting, but it is unknown the state of development of this partnership,
- With COFETARN / COMUDE actions have been developed for the conservation of watersheds but do not know the current state of development of such partnerships, and
- With JICA actions for the conservation of the watersheds of the three MHPs constructed by JICA are being carried out.

The evaluator found while visiting Xeul Canchel evidence of community development initiatives to conserve the watershed, with the benefits that derive from there (see Section 6.5.4). First of all, the generation of biogas in a demonstrative project that seeks to reduce the consumption of firewood in the area, a project that was found tightly assembled, operated and built with the beneficiary contribution in kind and in minor materials. We also found widespread use of composting plants for bio fertilizer production, built with contributions from the beneficiaries. Subsequently, the seedlings of small coffee plants to be planted in selected areas. Moreover the use of efficient stoves to reduce firewood consumption by two-thirds of the usual intake, project paid by the user using a revolving fund of the IDB-CNEE managed by FUNSOLAR. Also, a micro hydro power plant demonstrating the goodness of using water from the watershed to meet the basic electricity demand of the user. And finally the management of the slopes to control erosion.

The evaluator considers this *result as* **SATISFACTORY** (S).

3.3.5 <u>Outcome 4</u>: Conditions for project replication are established (including policy and regulatory proposals); monitoring, learning and evaluation

Indicator	Final goal at the end of the project (original)	Final goal at the end of the project (reviewed)	Observations
20. Monitoring, learning and adaptive feedback and evaluations	-Systematic monitoring of the system (using SIG) – M&E reports – Documents, reports and books with lessons learned and better practices – PURE website	Remains the same	
21. Policy and Regulatory framework	Plan the integration of rural energy and rural development (PURE) formulated and approved. - Proposal to adapt the law which allows the execution plan.	Remains the same	Documentation of all level incidences: municipal, local, national, etc. Make proposal studies that could help in terms of energy, by cases: Tacaná, Tajumulco, San Pedro (SM), Panzós(AV)
22.Carbon markets	n.a.	No. Of projects that would apply to a carbon market	Document the contacts with the places that currently make projects of voluntary markets

Table 3-23. Outcome 4.In	dicators and original	and revised goals
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Basic activity to establish the conditions of replication of the project are monitoring, learning and evaluation of the results achieved. For the execution of the projects, the PURE developed a whole promotional strategy consisted of working directly with the national government, regional

governments, rural municipalities, local authorities and rural communities. These activities were mainly carried forward directly by the PURE team coordinator with the participation of its staff and consultants. They interacted at all stages of the process and made all the necessary steps to close the project cycle, using as a means the direct interaction, dialogue and consultation between all actors. The process is complex and consists of several stages:

- 1. Organization / Elaborate technical profile
- 2. Signing Agreements with Partner Organization
- 3. Development of stakeholder mapping (identifying strategic alliances)
- 4. Application of Socioeconomic Census
- 5. Preparation of Technical Specifications (data collection)
- 6. Training Workshops / Training on issues
- 7. Accompaniment of Administrative/Organizational Processes
- 8. Educational tours for exchange of experiences
- 9. Technical Study of Pre-feasibility
- 10. Analysis of productive capacity
- 11. Natural resource management in the basin
- 12. Incidence and dialogues
- 13. Public-private investments, cooperation and investment by state
- 14. Implementation of projects

From this Project cycle the following lessons learned have remained:

- 1. **PURE Methodology**: This highly integrated and participatory approach for the promotion of renewable energy is the key to the acceptance of the projects by the communities.
- 2. Social Opposition: An approach with and from the base of the community reduces the causes of social opposition to small hydropower projects and should at least consider: 1) community improvement of technology knowledge, 2) provide reliable information on the strengths and weaknesses of hydroelectric projects, 3) clearly distinguish the difference between small and mega hydroelectric projects, and 4) encourage dialogue between actors.
- 3. **Integrated Rural Development**: Renewable energy projects like the ones promoted by PURE should not be isolated, but must be part of a comprehensive rural development strategy.
- 4. **Public-Private Partnerships**: Partnerships are the key to develop projects as most of them are not eligible for credit in the formal financial system and there are no sources of funding for individual projects.
- 5. **Costs**: The implementation of renewable energy technologies is costly. Costs depend on local factors and the implementation modality.

This Project cycle methodology has to be documented and disseminated like a common good for the involved actors of the productive uses of RE projects in the rural sector. The PURE model has been presented in **Workshops of Information Transfer** to the School of Agronomist Engineers in Huehuetenango, The Commission of Natural Resources of San Marcos –CORNASAM-, The Council of Department Development in Baja Verapaz and the Regional Climate Change Board of Verapaces in Alta Verapaz.

FUNSOLAR website <u>http://www.fundacionsolar.org.gt/</u> was checked for information on activities and achievements of PURE. A tab shows the PURE Program, where it presents the objectives, actors,

goals and geographic coverage. Later on, information on activities between PURE and other organizations such as the multi-sectorial strategy to support MHP under 15 MW, with the Avina Foundation (June 25, 2012), can be found. Also, it mentions a committee meeting of the PURE (10 November 2010). The description of activities starts on May 9, 2011 when the program began earlier this year, and the last FUNSOLAR newsletter covers the period Julio2010-June 2011.

The evaluator considers that this dissemination media of PURE activities could be used more intensively not only to disseminate information about the events but also to present their results and achievements.

The evaluator found that there have been opportunities to systematize the management of projects and draw lessons learned with recommendations to improve the implementation of projects and improve the chances of sustainability, which considers not been properly utilized such as the following examples:

- Project monitoring of MHPMHP missing a document of lessons learned.
- Lessons learned from successful stoves project
- Systematization of experiences on renewable energy in the PURE project areas (24-10-211).

One outcome of the project is to build capacity and strengthen institutions, not just the executing the project but all institutions and stakeholders involved in the development of the rural sector through the dissemination of results and evaluation of projects aimed to generate lessons learned.

The PURE has taken action in different sectors and areas which are of importance for the development of rural communities, taking into account the importance of the RE for productive use, conservation of natural resources and adaptation to climate change, such as:

Incidence:

- Multi-sectorial dialogue strategy to support small hydroelectric plants, seeking public-private partnerships to provide social viability of investments in hydroelectric plants in Guatemala and facilitating dialogue on positive and negative experiences on the development of hydropower projects.
- Establishment of the Small Renewable Energy Projects Network (REDPPER: Red de Pequeños Productores de Energía Renovable) and participation in defining the work plan of the network.
- Platform of the American proposal for equitable access to renewable energy (RENOVE, Avina Foundation).

Policies:

- Proposal to reform the 211-2005 Government Agreement.
- Law on Incentives for the Development of Renewable Energy Projects, Decree 52-2003.
- Presidential Forum on Environment and Development, with 8 institutions, to position the subject of renewable energy.
- Proposal for the inclusion of PURE Methodology in the energy policy of Guatemala.
- Proposal for a National Climate Change Policy.

Knowledge management:

- Best Practices Manual (12 chapters). This manual is under editing⁴⁸.
- Chel experience: First isolated micro-central in the country
- Experience of the Municipal Electric Company of San Pedro San Marcos, as successful example to strengthen similar projects.
- Systematization of lessons learned from 3 micro hydroelectric plants donated by JICA⁴⁸.
- 7 years of lessons learned in the productive use of renewable energy 48 .

FUNSOLAR has also worked in the search of institutional support for PURE continuation, obtaining some funds, with different agencies such as:

- Organization of American States (OAS) (Approved)
- Norwegian Church Aid (NCA) (Approved)
- Program of Green Business, UN women

In relation to policies and regulatory framework, FUNSOLAR has been working on a preliminary draft of Integral Energetic Policy for Guatemala that the evaluator considers it has an incipient state of development (Indicator 21).

And finally, in reference to the renewable energy Project inscription in carbon markets (indicator 22), this task was not carried out yet and corresponds to the project developers.

The evaluator considers that although the preparation of all documentation of lessons learned, successful projects, etc., is still lacking but currently under development and with expectations of soon completion, the goals of this result has been achieved **Satisfactorily** (S).

3.4 CURRENT STATE OF THE PROJECT

By December of 2012 the Project still has to execute:

- Completion of consultancies underway:
 - o Systematization the Electric Company of San Pedro Sacatepequez
 - Analysis of the impact of the implementation of renewable energy technologies and watershed management techniques
 - Energy generation with biomass (waste)
 - Between the beginning of this review (October 2012) and the end of 2012, the following tasks were executed that the evaluator had identified at the time as pending:
 - Management of Funds
 - Multisectorial Dialogue Strategy
 - Implementation of 8 biodigesters for productive purposes
- Monitoring visits to installed RETs
- Tour of sharing experiences with the accompanying committee. This has been replaced by a meeting with the Board for the presentation of the project results.
- Printing and Socialization of

⁴⁸ The evaluator had not the opportunity to check this document as he had not received it yet

- Manual of Recommended Practices
- Administrative Manual for Community Hydroelectric Projects
- General Systematization of PURE Lessons Learned
- Registration of at least 4 projects in the Clean Development Mechanism (Carbon markets). This will not be done by FUNSOLAR as it corresponds to each one of the representatives of the projects.
- Work to enter the proposed PURE methodology into the Energy Policy
- Financial audit (January-February 2013)
- Project Final Report by FUNSOLAR.
- Closing Event: Presentation of the final evaluation results and lessons learned with PURE

For that reason, the evaluator promptly recommended FUNSOLAR to ask for an extension of approximately 3 months starting from December 31, 2012 to close the Project.

3.5 CURRENT STATE OF THE BARRIERS

The evaluator considers that after the execution of the Project, the current state of the barriers is as given on Table 3-24.

It is to note that the policy-regulatory issues are under state control and that an organization such as FUNSOLAR, with its NGO character, could only promote and participate in debates, therefore the goals in terms of barrier removal are hard to accomplish.

The PURE Project as a whole could be considered as Moderately Satisfactory (MS).

ENERGY TECHNOLOGY	STATE OF THE BARRIER BEFORE THE PROJECT	STATE OF THE BARRIER AFTER THE PROJECT
Technology: RET connected to grids - small hydroelectric plants Energy supplier - (Energy)	 Social-institutional Inappropriate agreements on benefits between privates and local communities. Cultural gap between service policy/supply responsible and local population. Limited institutional mechanisms for conflict resolution and participation of interested parties. 	 Projects where the benefit spread would be negotiated were not done. <i>This situation remains the same</i>. The cultural gap related to RETs in rural communities <i>declined a Little</i>. Institutional mechanisms for conflict resolution are regulated by the state and <i>remain the same</i>. <i>al</i>. The social-institutional barrier was partially removed.
company <i>Type of</i> <i>financing:</i> - Own funds	<i>Policy-regulatory</i>- Lack of regulations to incorporate the RETs	 The development of MHPMHP connected to the grid was very limited. Regulatory instrument proposal for RETs was limited <i>The Policy-Regulatory barrier was partially removed.</i>
(supplier) - Loan (bank)	 Market and Finance Private investors did not perceive the economic benefits of the rural communities towards electricity Rural communities don't have income or energy demand to justify investments in energy 	The financial barrier for projects like photovoltaic systems, efficient stoves and bio digesters has been removed because users have proved the financial viability of them. Credit lines are still lacking. It has not been removed in projects of higher investment scale like the MHP.
<i>Technology:</i> Energy isolated from grid	<i>Technical</i> - Deficient technical support from the suppliers to implement the RETs.	• The small RET market has an effect on the high costs and limited technical support by the suppliers <i>This technical barrier was not removed</i>
 mini hydroelectric plant micro hydroelectric plant solar PV 	Social-institutional - Cultural gap between the policy responsible and the local population	 The Project developed capacity and companies strengthened with UPE (solar energy, biogas, MHP). A good part of this dimension of the Social-Institutional barrier was removed
 thermic solar <i>Energy supplier:</i> (Energy) company Municipality 	<i>Capacity and knowledge</i> - The weaknesses in the involving of productive uses, micro-enterprise management, energy supply and finances, contributing to the lack-of-support cycle	 In addition to previous comments, PURE introduced better watershed management practices. A good part of this Capacity and Knowledge barrier was removed
- (Energy) company - Municipality	management, energy supply and finances, contributing to the lack-of-support cycle structured for PURE.	A good part of this Capacity and Knowledge barrier w removed

Table 3-24. Effect of the Project in relation to the barriers

ENERGY TECHNOLOGY	STATE OF THE BARRIER BEFORE THE PROJECT	STATE OF THE BARRIER AFTER THE PROJECT
- Community - Final user <i>Type of</i> <i>financing</i> :	Market and Finance - Energy supply based on RETs outside the grid is not related to the generation of income and (micro) financing, which creates a	• Projects of productive uses (coffee, cardamom, Wood) were not implemented and the MHP energy just now started to be used.
 Equity (company or final user) Loan (financial intermediary) 	 sustainability problem for projects outside the grid. Lack of loans for micro-enterprises for RETs and PURE. Weak Access to 'added value' products to (international) markets. 	This Market and Finance barrier was not removed
- Grant (government, municipality, donor)	 (international) markets Policy-regulatory Lack of monitoring tools to show relations between energy, income generation, natural resources and risk management in watersheds. Separate rural development planning and energetic planning to local and national levels, and between government levels Rural energy policy, based on grid extension, lacks the framework and consistent instruments to allow communities to Access the energy service 	 A database of methodologies, information, evaluations that have translated into good practices manuals, administrative manuals, and PURE methodology among other that have to be finished in editing and be spread. PURE has contributed in the discussion of rural electrification, but the country has to strengthen even more its incipient strategy of rural electrification PURE contributed to partially remove this Policy-Regulatory barrier

4. CONCLUSIONS AND RECOMMENDATIONS

This chapter's objective is to establish Project conclusions as well as formulate recommendations to three Project actors: Guatemala Government Organizations (MEM, MARN, MAGA and other government organizations), FUNSOLAR and UNDP.

To MEM, MARN, MAGA and other government organizations

Conclusions

- RET use in the rural sector is in line with the environmental policy of the country and the real possibility of improving rural electrification coverage in the country.
- The political will of national, regional or municipal authorities and its support are an essential condition for the execution of projects.

Recommendations⁴⁹

- To ensure the sustainability of rural electrification systems with RET, additional State support (technical and financial) to rural communities is required.
- For the conservation of natural resources and in particular hydropower, the PURE has demonstrated the validity and importance of mechanisms for community participation and the value of the transfer of technical and management knowledge that are necessary for the conservation of basins.
- On the other hand, the needs of rural world include not only electricity but also other forms of energy (biogas and efficient stoves).
- Disseminate the achievements made by PURE program because it responds to real needs of rural and disadvantaged populations in the country.

FUNSOLAR

Conclusions

- This Project *has significantly contributed to:*
 - Place RET in the discussions on rural electrification in Guatemala
 - Develop PURE methodology and put it forward for energy policy
 - Empower communities through organization and management training in productive projects, natural resource conservation and use of RET.
 - Empower women from rural areas and ensure their participation in the project activities.
 - Develop and implement mechanisms for adaptation to climate change, such as watershed conservation.

⁴⁹ Implementation and following of these recommendations are out of the project's reach.

- Promote the use of simple, very efficient, technically, environmentally and economically sustainable technologies (efficient stoves and biogas), to reduce GHG emissions.
- Produce meaningful material for the identification, evaluation and monitoring of projects with RET productive uses.
- This project has:
 - Promoted and implemented off-grid MHP.
 - Partially complied with the goals of productive uses with RET (Valuable productive chains as coffee, cardamom, wood, were not implemented because RET were not implemented promptly; production chains as ecotourism have begun to be implemented at the end of the project).

Recommendations:

The following recommendations should be executed before the final execution deadline on March 31, 2013 and its implementation should be reported in the Final Report presented by FUNSOLAR.

- Completion of consultancies underway:
- Systematization the Electric Company of San Pedro Sacatepequez
- Analysis of the impact of the implementation of renewable energy technologies and watershed management techniques
- Energy generation with biomass (waste)
- Between the beginning of this review (October 2012) and the end of 2012, the following tasks were executed that the evaluator had identified at the time as pending:
- Management of Funds
- Multisectorial Dialogue Strategy
- Implementation of 8 biodigesters for productive purposes
- Document all agreements made with beneficiaries, duly signed.
- Attach list of equipment (inventory) and services delivered, auditing records of equipment and works, meeting records and studies delivered to beneficiaries and collect installed equipment warranties.
- Likewise, with the goods received from UNDP
- Formalize (legalize) the transfer of goods and services delivered to the beneficiaries in accordance with the procedures of UNDP
- Keep project equipment warranties and ensure fulfillment, because rural beneficiaries do not know how to proceed against claims.
- Tour of sharing experiences with the accompanying committee. This has been replaced by a meeting with the Board for the presentation of the project results.
- Printing and Socialization of
- Manual of Recommended Practices
- Administrative Manual for Community Hydroelectric Projects
- General Systematization of PURE Lessons Learned
- Registration of at least 4 projects in the Clean Development Mechanism (Carbon markets). This will not be done by FUNSOLAR as it corresponds to each one of the representatives of the projects.
- Work to enter the proposed PURE methodology into the Energy Policy

- Financial audit (January-February 2013)
- Project Final Report by FUNSOLAR.
- Upload project information to FUNSOLAR website, and direct other organizations links towards FUNSOLAR website.
- Closing Event: Presentation of the final evaluation results and lessons learned with PURE

UNDP

Conclusions

- The formulation of ambitious goals is often counterproductive in terms of final project results.
- It has been demonstrated once again the importance of the mid-term Assessments as a tool to redirect the course of the projects.

Recommendations⁵⁰

- The *co-financing resources* must be *secured* with real disbursement commitments since co-financing letters of intent are insufficient.
- Consider as a certain risk the likelihood that the implementing agency, in the case of NGOs, can dissolve during project implementation.
- The information generated, evaluated experiences and lessons learned from UNDP projects should be shared across a web based platform.
- Continue to strengthen gender perspective as part of the activities in these projects

⁵⁰ Implementation and following of these recommendations are out of the project's reach

5. LESSONS LEARNED

- Initially 4 years to run a program that hopes to remove national barriers, as intended in the design, is a short time.
- It is necessary to promote the development of a clear policy of Rural Development with the steadfast participation of the State through strategic alliances involving other stakeholders.
- Co-financing resources must be secured with real disbursement commitments since letters of intent are insufficient.
- One of the key aspects to the success of RET projects is to design and consider different management schemes leading to the sustainability of projects.
- The introduction of RET in rural areas is costly regarding the income level of the beneficiaries so that they should receive state support (financial, technical and know-how)
- The high cost of several RET remains a barrier to rural sector development. The proper selection of technologies is essential and their appropriation by the stakeholders in the country.
- The perception of high risks by the private sector and weak market signals, without tariff and regulatory signals that stimulate the penetration of private sector projects will continue to constrain private sector participation in the development of RET.

6. ANNEXES

6.1 TERMS OF REFERENCE

1. Introduction

According to the UNDP Monitoring and Evaluation policies and procedures, and the Global Environment Facility (GEF), the final assessment is required for projects such as the Productive Uses of Renewable Energy in Guatemala – PURE. This assessment was provided in the project's design as well as in its mid-term assessment, which has a report, an input for this final assessment. This process will focus in the same assessment elements from the mid-term and will additionally focus in the final results and the sustainability of the achieved goals of the projects.

2. Background and context

The Project of Productive Uses of Renewable Energy in Guatemala-PURE-aims: To promote renewable energy in communities where the local property value will increase through the use of renewable energy. This will be done by linking the renewable energy potential of the country with the efforts being made by Guatemala to reduce poverty, promote rural development and protect natural resources, in order to integrate sustainable energy in the production process as a fundamental supply to support efforts through provision of renewable energy and the promotion of productive uses of energy.

The PURE includes the following results: (Annex A. Results Framework)

- Development and promotion of 1.5 megawatts of technology outside of the supply network, for productive uses of energy.
- Development of 13.5 megawatts and promotion of renewable energy technologies in the private sector connected to the national grid (small hydroelectric plants).
- Sustainable management of natural resources and energy in river basins.
- Establishment of project's replication conditions, including proposals.

The PURE project follows the GEF climate change focal area, particularly the operational program 6 that promotes the adoption of renewable energy by removing barriers and reducing implementation costs. Under the GEF strategic priorities, the project CC-4 talks about productive uses of energy. Also, mentions the integration of watersheds integrated management to improve natural resource administration associating PURE initiative with the strategic priority of adaptation.

The PURE project complements energy programs and activities undertaken by UNDP initiatives in Guatemala, incorporating lessons learned and identified needs during implementation. These initiatives have created the base and the political experience that has allowed the social basis structure to administrate energy project at the local level, strengthening the institutional capacities of communities and local governments. This experiment supported the initiative of the PURE design.

The initiative is being combined with other large projects related to natural resource management, poverty reduction and peace strengthening of Guatemala.

The key concept is the renewable energy promotion in communities for productive applications that generate income and improve social welfare. This will be achieved by linking the renewable energy potential (particularly hydropower) with rural development efforts and integrating sustainable energy as a key supply to the production process. The project will link local producers with national and global markets. This will generate additional income, thus alleviating the poverty in these areas and facilitating access to financial resources for more sustainable renewable energy rural projects. This is an innovative approach compared to traditional efforts that focus on basic energy needs only. That is, energy is a vital supply in the rural context development that catalyses a value added to the productive chain.

3. Assessment purpose

The PURE Project final assessment seeks to identify the achievement of the results defined in such project, to draw lessons that can be replicated in future projects with productive uses of renewable energy and define mechanisms to improve and ensure the sustainability of the benefits generated by the project.

4. Scope and assessment objectives

The final evaluation will focus on the following aspects:

- Project design.
- Project Execution.
- Framework Results contribution and resources to achieve the desired results:
 - ✓ The evaluation shall analyze the framework results matrix and determine the consistency and logic of the results proposed.
 - ✓ Results Impact: The assessment also should speak formally about the project activities status to achieve the objectives and proposed outcomes and whether these have been appropriate, feasible and consistent with the institutional and legal context of the project.
 - ✓ Financial and planning management.
 - ✓ Stakeholders Participation: it is important that the assessment reviews the institutional arrangements that were designed to meet the project immediate objectives and also develop robust systems and structures within relevant local institutions that serve as long-term control. The assessment should also analyze the existing mechanisms for disseminating information about the project during its preliminary implementation and degree of stakeholder participation in management or decision making of the project, emphasizing the following: a). The production and dissemination of information generated by the project, b). The stakeholders participation (especially local) in the execution and decision making of the project and an analysis of the strengths and weaknesses of the mechanisms adopted by the project in regard to the participation of local stakeholders and users of renewable resources c). The establishment of partnerships and collaborative relationships fostered by the project with local, national and international entities, and the effects they have had on the implementation and performance of the project; d). The linkage of governmental institutions in project implementation and the role of these in the execution e). The role of the project's Committee of Follow Up to support the implementation.

- ✓ Monitoring and follow-up Strategy: the monitoring and tracking system should be checked to determine the project results progress through activities such as identifying performance indicators, measurement procedures, and determination of baseline conditions should be reviewed.
- ✓ GEF Portfolio Coherence: identifying intervention coherence of GEF Focal Point in Guatemala (Minister of Environment and Natural Resources), the relationship and bond with government institutions especially with the Ministry of Energy and Mines.
- ✓ Sustainability: Sustainability is important to analyze the technical, economic, financial, social, cultural and environmental.
- ✓ Community participation (civil society).
- ✓ Strategic alliances, partners and co-financing.
- ✓ Indicators: similarly it is expected that the evaluation analyze the validity and feasibility of the proposed indicators in the results framework and whether these have guided the project and review the scope of preliminary achievements in a systematic and progressive manner.
- Lessons learned and recommendations for future projects:
 - ✓ Identify lessons learned: for instance: a) The experiences / best practices of the project as well as those that still being challenges should be highlighted and detailed; and b) The means by which the lessons and experiences of the project will be replicated or extrapolated must be determined in the formulation and implementation of other projects.
 - ✓ Recommendations: What kind of recommendations can be proposed for future implementation of similar projects by the Solar Foundation and other institutions concerned: a) recommendations from the project results framework? b) Recommendations to increase the impact in line with the objectives and results originally proposed? c) Recommendations on budget execution? d) Recommendations on topics to be considered during the evaluation and monitoring? e) Recommendations on relations with local communities? f) Other consideration by the evaluators.
- Transversal approaches:
 - ✓ The assessment will review the level of approach and integration to the project in other UNDP priorities, including support for reducing poverty, improving governance, prevention and recovery from natural disasters, and gender.

The objectives of the assessment are related to the criteria of relevance, efficiency, effectiveness, sustainability and impact of the PURE Project:

Relevance:

Identify whether the outputs and outcomes defined in the project coincide with national and local priorities, specifically in the areas where the project was implemented. Also assess the contribution of it to solve the beneficiary's needs. This review will focus on the strategy that propelled the project to achieve the results and whether this strategy has the population and beneficiary institutions acceptance.

Efficiency

Assess the achievements covered and not covered in the PURE project original design. Identify whether the observed results are due to the activities and products developed by the project. Determine

the project's contribution to solve the problem identified at the beginning of the project.

Effectiveness

Analyze PURE Project implementation, focusing on the measurement of inputs and resources used by the project and how these results have been converted into economically. This analysis includes the cost-benefit ratio, transaction costs, fulfillment of the time established for planning and procedures review.

Sustainability

Review within the economic, political and institutional framework conditions that are related to the topics addressed by the PURE, the potential and opportunities of capacity generated by the population and institutions, as well as the achievements of the project to continue in the future, after completion thereof.

Impact

Assess what is the contribution of the PURE project achievements, towards the change in welfare conditions of the target population.

5. Methodology

The methodology will be developed in detail by the consultant. The main elements to be considered for the development thereof are:

- The final evaluation is contemplated in the project design.
- There is a report of midterm evaluation.
- The project defined a framework of results and resources, which is the logic of intervention and the results hierarchy to which the project was committed to achieving.
- The project has a monitoring system, which has defined indicators that have been followed to check the goals compliance.
- The evaluation team used the criteria of relevance, effectiveness, efficiency, sustainability and impact for the development of the final evaluation.
- A series of questions were developed, which should be answered with information generated by the assessment, in order to provide users with the information necessary for decision making in possible future projects of the same nature. The questions have been included in a matrix, which is found in **Annex C**. The evaluation team may expand the questions, they must complete it and submit it as part of the initial assessment report and included as an annex to the final report.
- The assessment will also conduct a review of the major information resources available for the project and that have been generated during implementation. Such as the project document, quarterly and annual reports, annual reviews, midterm evaluation, budget reviews, progress reports, project files, national strategic documents and legal and any other materials that the consultant considers useful for this assessment. A list of documents that the project team will provide to the evaluation team is included in **Annex B**.
- The evaluation process will be participatory and with consultative activities to a greater number of stakeholders, beneficiaries, community organizations, government counterparts, civil society, the project team, technical advisors and focal point of the GEF, UNDP staff, for which is recommended structured and semi-structured interviews. A minimum list of people interviewed

is in Annex B.

- In the evaluation process a visit to the project intervention areas will be included: El Quiché, Huehuetenango, Alta Verapaz, Baja Verapaz and San Marcos.
- The evaluation must provide information based on reliable, accurate and useful evidence. It is required that the evaluation team makes an assessment of project performance. This assessment has elements to qualify and a rating scale, which is detailed in Table No. 2. This table must be properly completed and be including in the executive summary of the assessment. Mandatory rating scales are included in **Annex D**.

1. Monitoring and Assessment	Qualification	2. Implementing Agency and Executing Agency	Qualifica tion
Monitoring design and initial assessment		PNUD quality of implementation.	
Implementation of Monitoring and Evaluation plan		Quality of execution – Executing Agency	
Genetal Quality of Monitoring and Evaluation		Quality implementation / execution	
3. Results Assessment	Qualification	4. Sustainability	Qualifica tion
3. Results Assessment Relevance	Qualification	4. Sustainability Financial Resources	Qualifica tion
3. Results Assessment Relevance Efficiency	Qualification	4. Sustainability Financial Resources Socio-political	Qualifica tion
3. Results Assessment Relevance Efficiency Efectiveness	Qualification	4. Sustainability Financial Resources Socio-political Institutional and governmental framework	Qualifica tion
3. Results Assessment Relevance Efficiency Efectiveness General qualification of the project's results.	Qualification	4. Sustainability Financial Resources Socio-political Institutional and governmental framework Environment	Qualifica tion

Table No. 2. Qualifications of the performance evaluation of the project

• The assessment will review major financial aspects of the project, including the achievement of planned co-financing. Also, it will review the project costs and the funds information required, including the annual expenses of the project. The differences between planned expenditures and actual expenditures will be reviewed and analyzed. The results of the recent financial audits will be taken into consideration. The evaluation team will have assistance of the UNDP office in Guatemala and the project team (Solar Foundation), to obtain financial data to complete Table no. 3 related to co-financing. The table will be included in the final evaluation report.

Co-financing (typw/resources)	UNDP own financing (mill. US\$)		Government (mill. US\$)		Partner Agency (mill. US\$)		Total (mill. US\$)	
	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual
Grants								
Loans/Concesions								
• In-kind support								
• Other								
Totals								

 Table No. 3.
 Co-financing Analysis

6. Evaluation Products

Table No. 4	Required	products for the	e final assessment	of the PURE Project:
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Product	Contents	Time	Responsibilities		
Initial Report	The initial report will detail the	No later than five calendar	The consultant will deliver		
	consultant's understanding on what	days after the contract is	it to the UNPD office in		
	is proposed to assess and why.	signed.	Guatemala.		
Final Assessment	The final assessment draft will	No later than fifteen	The consultant will make a		
Draft	cover all the subsections required in	calendar days after	presentation on the main		
	the Final assessment report format.	receiving the initial report	findings. The draft of the		
	Annex F.	approval.	final assessment will be		
			delivered to the UNPD		
			office in Guatemala, which		
			will be revised by the		
			Officer of Environment and		
			Energy Program and the		
			Regional Technical		
			Advisor.		
English and	Final assessment report checked in	Seven calendar days after	Delivered to the UNPD		
Spanish version of	both languages.	receiving all observations	office in Guatemala.		
the Final report		from the responsible			
		people.			

7. Evaluator or team composition and skills required

The evaluator must submit the following requirements:

- Master's degree in financial management, business, political science, environmental engineering, environmental science or other related field.
- At least 10 years of relevant professional experience.
- Knowledge of the operation of the United Nations Program for Development and the Global Environment Facility GEF (FMAM, acronym in Spanish).
- Experience in design and / or implementation of monitoring and evaluation systems, preferably in UNDP-GEF projects (GEF).
- Previous experience in results-based management and assessment methodologies.
- Extensive proven experience in projects related to the productive uses of renewable energy.

- Knowledge of governmental, non-governmental and private sector related to the environment and conservation of natural resources.
- Excellent communication skills verbal and written.
- Proficient in both Spanish and English.
- Ability to conduct field visits
- Fully proficient in the following software applications: Word, Excel, Power point.

8. Evaluation Ethics

The consultant will keep the highest ethical standards and is required to sign a Code of Conduct (**Appendix E**) to the acceptance of the contract for this evaluation. UNDP evaluations are conducted in accordance with the principles outlined in the "Ethical Guidelines for evaluations" Assessment Group UN (**Appendix H**).

9. Implementation Arrangements

The principal responsibility for managing this evaluation lies in the UNDP country office in Guatemala. The UNDP office will hire the evaluator/evaluation team and ensure the timely provision of the relevant payments in joint responsibility with Solar Foundation, implementing partner of the project.

The PURE Project Team will be responsible for coordinating with the consultant to arrange interviews with the actors/keys organize field visits, coordinate with the various government institutions, etc.

6.2 ITINERARY

Table 6-1. Aerial and Terrestrial Routes of H. Rodríguez

Date	Dat	Hour	Aerial route	Terrestrial route
28-oct-12	Sunday	10:05	Bogota - Guatemala City	
29-oct-12	Monday	07:00		Guatemala City - San Marcos
30-oct-12	Twesday	14:00		San Marcos - Tacana- San Marcos
31-oct-12	Wednesday	07:45		San Marcos - Guatemala City
01-nov-12	Thursday	13:00		
02-nov-12	Friday	08:00		Guatemala City - Xéul - Salamá
03-nov-12	Saturday	08:00		Salamá - Cobán
04-nov-12	Sunday			Cobán - San Juan Chamelco - Cobán
05-nov-12	Monday			Cobán - Rio Dulce
06-nov-12	Twesday			Rio Dulce - Las Conchas - Rio Dulce
07-nov-12	Wednesday			Rio Dulce - Guatemala City
08-nov-12	Thursday	13:00:00	Guatemala City - Bogota	

6.3 LIST OF VISITED INSTITUTIONS AND INTERVIEWED PERSONS

Fecha	Hora	Reunión / Entrevista	Lugar	Nombre	Cargo	Ciudad	Indic	Tel	e mail
				Flor Bolaños	Oficial Energía Medio Ambiente, PNUD	Guatemala City	502	23843288	flor.bolanos@undp.org
		Reunión de Apertura:		Nely Herrera	Oficial de Monitoreo y Evaluación, PNUD	Guatemala City	502	23843165	nely.herrera@undp.org
	07:00	Presentación del PURE	Oficinas del PNUD	Manuel Basterrechea	Director Fundación Solar	Guatemala City	502	23691181	asebaste@gmail.com
	07.00	avanças ajustas de agenda	Onemas deri NOD	Cynthia Loria	Equipo de Fundación Solar Central	Guatemala City	502	23691181	cynthialoria@gmail.com
		avances, ajustes de agenda.		Virginia Rodas	Coordinadora PURE, Fundación Solar	Guatemala City	502	23691181	vickyro@yahoo.com
				Marta Estrada	Asistente de Planificación, Fundación Solar	Guatemala City	502	23691181	mestrada@fundacionsolar.org.gt
	00.00	Paunión con staff PNUD	Oficinas del PNUD	Flor Bolaños	Oficial Energía Medio Ambiente, PNUD	Guatemala City	502	23843288	flor.bolanos@undp.org
Lunes 29	09.00	Realion con start 1 NOD	One mas dell' NOD	Nely Herrera	Oficial de Monitoreo y Evaluación, PNUD	Guatemala City	502	23843165	nely.herrera@undp.org
de Octubre	11:00	Entrevista con Miembros del	Oficinas Fundación	Magalí Quintana	Vicepresidenta del Comité Directivo de Fundación Solar	Guatemala City	502	23691181	
2012	11.00	Solar	Solar	Vivian Lanuza	Secretaria	Guatemala City	502	23691181	
	11:30	Entrevista con Lucía España, encargada de la Estrategia Multisectorial para el apoyo a pequeñas centrales hidroeléctricas	Oficinas Fundación Solar	Lucia España	Estrategia Multisectorial, Fundación Solar	Guatemala City	502	23691181	
	14:00	Reunión con Viceministro de		Edwin Rodas Solares	Viceministro de Energía y Minas	Guatemala City	502	24196464	erodas@mem.gob.gt
Miércoles 7 de Noviembre	08:30	DICODER-INDE	PNUD	Ing. Hugo Rodas Marotta	Jefe de la División Coordinadora de Electrificación Rural -DICODER- Gerencia de Electrificación Rural y Obras Instituto Nacional de Electrificación	Guatemala City	502	24222189	hrodas@inde.gob.gt
2012	10:30	Comisión Nacional de Energía Eléctrica - CNEE	CNEE	Ing. Sergio Velásquez	Gerente General, Comisión Nacional de Energía Eléctrica-CNEE	Guatemala City	502	2321800	svelasquez@cnee.gob.gt
				Flor Bolaños	Oficial Energía Medio Ambiente, PNUD	Guatemala City	502	23843288	flor.bolanos@undp.org
Ineves 8	07:00	Presentación Resultados	PNUD	Nely Herrera	Oficial de Monitoreo y Evaluación, PNUD	Guatemala City	502	23843165	nely.herrera@undp.org
Noviembre	07.00	Preliminares	TROD	Manuel Basterrechea	Director Fundación Solar	Guatemala City	502	23691181	asebaste@gmail.com
2012				Virginia Rodas	Coordinadora PURE, Fundación Solar	Guatemala City	502	23691181	vickyro@yahoo.com
2012				Marta Estrada	Asistente de Planificación, Fundación Solar	Guatemala City	502	23691181	mestrada@fundacionsolar.org.gt
	10.30	Ministerio de Ambiente y	PNUD	Paola Morris	Coordinadora de la Unidad de Relacione	Guatemala City	502	24230502	pmorrison@marn.gob.gt
	10.50	Recursos Naturales MARN	TROD	Erick Menzel	Asesor Jurídico Ambiental - MARN	Guatemala City	502	24230502	emenzel@marn.gob.gt

6.4 INTWERVIEWS SUMMARY

Place:	Guatemala City				
Consultant:	Humberto Rodríguez				
Project:	Productive Uses of Renewable Energy in Guatemala – PURE				
Dates:	October 29– November 9 2012				
Objectives:	 Obtain first-hand key information Get rid of doubts about the previously-made documentary revision. 				

Date	Meeting and Main Considerations
Monday, October 29, 2012	 7:00 to 9:00. PNUD Results presentation of the PURE II. Attended: PNUD: Flor Bolaños, Nely Herrera FUNSOLAR: Manuel Basterrechea, Cynthia Loria, Virginia Rodas, Marta Estrada Cynthia Loria of FUNSOLAR made the presentation of the PURE results, result by result. The presentation was very enlightening to the evaluator because it helped to form a more complete picture of the project and its scope. In the coordination meeting the schedule of meetings and technical visits was reviewed and adjusted.
	2. 09:00 to 10:30 Meeting with UNDP staff Questions about the Project related to its interaction with the PNUD and mainly administrative procedures were made.
	3. 11:00 to 12:00 Interview in FUNSOLAR with members of the Foundation's Board. The foundation was visited and there was an introductory meeting with some members of the Board of the Foundation. With Lucia España, responsible for the multi-sectorial strategy to support small hydroelectric plants, we exchanged information on current projects and actions developed in pursuit of sustainability of the projects.
	 4. 14:00 to 14:30 Eng. Edwin Rodas Solares, Vice-Minister of Energy, (502) 2476 3175 In brief exchange of information, he was informed about the project's evaluation mission and goals. The Vice Minister highlighted the importance of the project for the Ministry of Energy for its impact and benefits of it for the people in the rural sector.
Wednesday November 7 2012	 8:30 to 10:10 Eng. Hugo Rodas Marotta, Chief of the Coordinating Division of Rural ElectrificationDICODER-Management of Rural Electrification and Works of the National Institute of Electrification -INDE-7a. Avenida 2-29, zona 9, Phone: 24222017
7,2012	INDE functions are generation, Electricity transportation (80%), energy trading (ECOE: Energy Trading Company) and rural electrification. It is also the

Wholesale Market Administrator: dispatch.
Guatemala has an Electrification Program (PER). They started 10 years ago with a service coverage ratio of 55% and reached 85% in 2012. The REP ends this year of 2012. The REP funding has come primarily from resources coming from the privatization of the electricity sector.
US\$ 333M have been invested in the PER, of which 100 came from the distribution assets, government funds and a loan of US \$55M granted recently by IADB to complete the PER, of which 23 are for transmission, 23 for distribution and 5 for isolated systems.
In the PER, the reference cost for rural electrification is approximately Q 6,712, US\$ 858.26/family (Q 7.82 / US\$), can be up to $+$ 10%. The average power installed in rural areas is 600 W / family but historically has been 350 W / family.
As for PURE, this project comes to fill a void of INDE and are getting to the essence of rural electrification which is to raise the living standards of the villagers. He considered admirable the social approach as it is a very difficult social problem because of the electricity rates in the east and west regions of the country.
INDE participation in PURE consisted in attending meetings to discuss policies, but INDE had no commitment with any counterpart.
In his opinion, FUNSOLAR should continue the PURE becoming more efficient, and improving its technical and financial performance.
As for the results, it is considered to be a very good initiative but it must cut costs, produce locally turbines up to 1 MW, like the Pelton and Francis (there are two or three national companies that supply these turbines). FUNSOLAR's approach to work with communities has gone very well.
Since in their opinion the private sector does not enter to electrify the rural sector, the state must have an energy policy for the rural sector and get involved in it.
 10:30 Eng. Sergio Velasquez, General Manager, National Commission of Electric Energy-CNEE, and Eng. Byron Azurdia. 4a. Avenida 15-70, zona 10, Edificio Paladium, Nivel 12; Phone 23218000
The participation of the PURE in the CNEE occurred in two ways: supporting technical conferences organized by PURE, concepts issued on the regulatory framework and field visits with beneficiaries explaining the regulatory framework and how they can make projects. Eng. Byron Azurdia visited communities in San Marcos, Coban, and Salama to sensitize community leaders. And participated in Accompaniment Committee meetings.

	In developing a project with the IDB, FUNSOLAR was hired to develop a project with efficient stoves. The total value was US\$ 25,000, of which US\$ 20,000 were used to establish a revolving fund. The project installed over 400 stoves and IDB evaluator considered it successful, as well as the evaluator of PURE. The CNEE in the context of this project also conducted other renewable energy demonstration projects.
	An important contribution of CNEE development of renewable energy is the NORM OF DISTRIBUTED RENEWABLE ENERGY GENERATION whereby you can use water resources without authorization for plants less than 5MW and do not require environmental authorization (only submit environmental studies).
	 . Eng. Velásquez believes that: Projects like PURE sensitize rural communities and their leaders for the development of energy projects of national and local interest. One of the strengths of PURE is that involves rural communities. In large projects there are many conflicts by non-participation of rural communities. One example mentioned was the Chixoi Hydroelectric Plant, built in 1982, of which there are still problems with the communities.
	As for the existence of a Rural Electrification Strategy, the constitution establish that it is a national urgency to electrify the country (what passes for Congress in first reading). From the General Electricity Law (LGE) in 1996, the electric sector is divided in three activities: generation (INDE), transportation (INDE) and distribution. But municipalities can have the whole chain of the electricity supply. The rep above was funded with US\$ 365M. The second stage has a loan of US\$ 55M and is conducted by NRECA. The new plan aims to reach 90% coverage in rural areas. FUNSOLAR has a large playground with renewable energy as they have good knowledge of rural communities; its penetration in the communities is extensive and has achieved high sensitization
	7. 7:00 Preliminary Results Presentation of the PURE II Evaluation. Attended:
	• PNUD: Flor Bolaños, Nely Herrera
	• FUNSOLAR: Manuel Basterrechea, Virginia Rodas, Marta Estrada Presentation of first findings in PNUD (see <i>powerpoint</i> presentation and attendance list in Annexes section.)
Thursday, November 8, 2012	8. 10:30 Lic. Paola Morris , Coordinator of the Unit of Relations and International Cooperation together with Lic. Erick Menzel , Environmental Law Consultant of the Direction of Environmental Management and Natural Resources. Recursos Naturales, 20 calle 28-58, zona 10, Edificio MARN, Phone 24230500
	 According to the Environment Ministry, The project had an interim due to changes in the FUNSOLAR direction. There has been a deficiency in the participation of the agencies as a result of rotation of personnel the governmental agencies and in the selection of the new FUNSOLAR staff.
	• GEF is a leveraged fund and no serious co-financing commitments were

	made with the project co-financers.
	• A manifested project weakness was the deficiency in communication with
	FUNSOLAR. It has been said, information from FUNSOLAR to all
	stakeholders has been missing.
	• Implementing agencies considers MARN as a stage in the GEF process and
	lack of inclusion of MARN in the window of opportunities of the projects.
XX7 1 1	9. 10:30 to 11. Raúl Alfaro, Regional Technical Advisor, UNDP-GEF.
wednesday	Currently in charge of the Project.
28 November	The dialogue was focused for $\frac{1}{2}$ hour in a presentation on the findings of the
November,	evaluator. Mr. Altaro concurred with the findings of the consultant in each of the
2012	the evaluator made to the project
	10 11:00 to 12:00 Oliver Page Regional Technical Advisor UNDP-CEF
	Former officer in charge of the project
	Former onicer in charge of the project.
	The appraiser agrees that the project has a very ambitious in scope in its
	formulation. Indicators are also too many and extent. The focus of the project was
	to support the development of the RET rather than building plants. To succeed
	with productive projects, the implementation of the RET should have been made
	in the beginning of the execution of the project.
	Following the difficulties encountered in FUNSOLAR there was an important
Monday, 10 December,	delay in implementing the project, and FUNSOLAR had to reduit technical
	disappear as an institution
	disappear as an institution.
2012	To implement grid connected MHP. Funsolar had opened doors to break the
	barrier of distrust between the peasants and the private sector to facilitate
	management arrangements and advance these projects. It was expected that
	FUNSOLAR could mediate between these two sectors.
	The result three related to the watershed management and conservation is an
	innovative climate change adaptation project.
	The evaluation should show the progress of each outcome, highlighting what was
	uone, what was not done and that could have been done, the lessons learned and what should not be repeated in new projects
L	what should not be repeated in new projects.

6.5 FIELD TRIP ABSTRACT

The figure below shows with pins the places visited where the consultant had the opportunity to talk with the PURE project beneficiaries. The distance covered in six and a half days was a total of 700 km to the northwest of Guatemala City and 1200 km to the northeast of the city.

Figure 6-1. Places visited by the evaluator (Yellow pins)



6.5.1 Beneficiaries 1. Tacaná – MHPs Projects

- 1. MINI HYDROELECTRIC PLANT PROJECT COATAN I, TACANA, SAN MARCOS
- 2. SMALL HYDROELECTRIC PLANT PROJECT COATAN III, TACANÁ, SAN MARCOS

Place: Tacaná Date: October 30, 2012

Attending in the Meeting:

- Feliciano Arreaga Velásquez, Tacaná Municipality Council (Period 2008-2012), Cellphone: 46202040
- Mary Flor Pérez González, Coordinator of Organization of Civil Society; Cellphone: 53561942
- Demis Royer Del Águila; First Officer of the Municipality Planning Direction Activities related to electric energy in Tacaná. Cellphone:45764378
- Macedonio Pérez, Coordinator of the Municipality Office of Water and Healing. Cellphone:40147785

- Manuel Basterrechea, Board of Directors President, FUNSOLAR
- Virginia Rodas, Coordinator of PURE Project, FUNSOLAR
- Marta Cecilia Estrada, PURE Project Planning, monitoring and Evaluation assistant, FUNSOLAR
- César Echeverría, PURE Project promoter in the San Marcos y Huehuetenango departments, FUNSOLAR
- Humberto Rodríguez, PURE external evaluator.

Background

For 50 years, the town operated two MHPs on Coatán River with a capacity 2 x125 kW. For 6 years came out of service and now have only a 125 kWp (developed by the Japanese agency JICA). Parallel to the grid of the municipality, Union Fenosa brought another grid 10 years ago. With the generation and grid, the charge of the municipality was 0.60 Q / kWh while the charge of Union Fenosa is 1.86 Q / kWh. In addition, there were two problems: Union Fenosa bills were considered too expensive and had problems with electrical energy meters.

Since the municipality has experience in the use of MHPs and abundance of water resources, they decided to promote the MHPs. The municipality then requested to FUNSOLAR prefeasibility studies of the Coatán River. The agreement with FUNSOLAR was signed in 2009, to manage, monitor and conduct the pre-feasibility studies. The prefeasibility studies were awarded to the company INGESA SA Structural Engineers following the procedures of UNDP-GEF. The study was completed in 2010 and the report was delivered in January 2011. The agreement ends in December 2012.

The study considers two plants: 2 MW and 14 MW with investment costs of about 71 MQ and 336 MQ. Given these investment costs, resources are being sought and the study has been submitted to the Embassies of Japan (February 2012), Norway (March 2012), Venezuela and to the AGAAI (Guatemalan Association of Indigenous Mayors and Authorities). The embassies have expressed interest in the project but there has been no further action.

The project has the support of COMUDE (Municipal Development Council) which is composed of people from civil society, government and non-governmental and municipal authorities.

The project is part of a FUNSOLAR project bank at Prefeasibility level.

Figure 6-2 show pictures of the meetings and the final presented reports.

Figure 6-2. MHP Projects (Coatán I and III) Tacaná

Beneficiary: Town of Tacaná Day of Visit: October 30, 2012



Meeting with autorities of Tacaná, members of FUNSOLAR and the evaluator



<u>Coatán Phase III – Feasability Study Final</u> <u>Report</u>



Coatán Phase I – Feasability Study Final Report

6.5.2 Beneficiaries 2. San Marcos – MHP project and Landfill

Place: San Pedro Sacatepéquez, San Marcos Date: October 30 and 31, 2012

Participants:

- Fredy Miranda, Council of 2nd Town Council, President of the Environment Comision, Town Development Council –COMUDE-
- Juan Manuel Santisteban, Sanitation technitian (Comunity of the Naranjo River basin)
- Eng. Silvia Tul de León, in charge of the operation of the San Pedro Sacatepéquez Landfill
- Christian Siliezar, Carvel Services, Cel. 23339382
- Edward Navarro, II Trustee and in charge of the Town's Electric Company
- Manuel Basterrechea, Board President, FUNSOLAR
- Virginia Rodas, PURE project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE project planning, monitoring and evaluation assistant, FUNSOLAR.
- César Echeverría, PURE project promoter in the San Marcos and Huehuetenango departments, FUNSOLAR
- Humberto Rodríguez, PURE external evaluator

In this meeting two projects in which FUNSOLAR was involved were discussed:

1. MHP

This project comes at the initiative of COMUDE (Municipal Development Council) due to rising electricity rates. The municipality of San Pedro Sacatepequez made agreement in 2009 with FS to develop a PF study for MHP Corral Grande. FS had already participated in studies and projects integrated management of water resources in the upper basin of the Rio Naranjo, in plants nursery establishment and participation in training activities. The study of PF was delivered in January 2011. The capacity of the MHP has been estimated in several ways, but according to the pre-feasibility study carried out under the PURE project, it was estimated that the installed power in assessed points is of 2,479 MW taking into account the rights of way in the jurisdiction of Village Corral Grande where we will construct the water catchment of Naranjo river.

The municipality has a business plan for the project. For the follow-up phase the Municipality has US\$ 10,000 intended as cofunding or for the 30% that should have if the project is done through loans. The promoters are currently seeking for funding from the private sector and with the IDB and the CABEI to continue the project.

The municipality has industry experience as it has the MUNICIPAL ELECTRIC COMPANY OF SAN PEDRO SACATEPEQUEZ and aims to create a generation company. The electric company currently buys power in bulk to INDE and sells it using their own distribution grids. This company has a favorable balance in its operation.

2. Landfill

The Solid Waste Landfill of San Pedro is located 11 km from the town and receives 26 t / day at present, the estimated population is 76,000 (not all trash goes to the landfill). The landfill has a year of operation and has an additional incinerator.

The agreement with FS is to evaluate the potential of biogas generation and its catchment for electricity generation or for other permissible productive use. Services were contracted to Carvel Services company. The study is in progress and will be completed between November and December 2012. At present some preliminary results are: 7 m3 / h (54% methane), and is expected to increase up to 11 m3 / h in 2013 and up to 21 or 32 m3 / h for 2014, which is expected to generate up to 200 kW electric, saving about 500 gal diesel oil / month.

Figure 6-3. San Marcos Landfill

Beneficiary: San Marcos Municipality Day of Visit: 31 Oct 2012



View of the landfill chimneys



Biogas combustion test
6.5.3 Beneficiaries 3. SFV Connected to Grid

Date: October 31, 2012 Place: San Marcos Participants:

- Entrepreneurial Women's Association of Esquipulas for Rural Development
- Luisa Francisca López Barrios, Association leader, Cel. 41411497
- Manuel Basterrechea, Board president, FUNSOLAR
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant, FUNSOLAR
- César Echeverría, PURE Project promoter in the San Marcos y Huehuetenango departments, FUNSOLAR
- Humberto Rodríguez, PURE external evaluator.

This women's association has nine years of activity and currently consists of 9 women. One of its main activities is the greenhouse tomato crop, which is of excellent quality and is sold in the local market and in San Pedro.

For the water management and greenhouse it requires water and pumping, for which they use an AC pump which is fed from the internal house grid. The project involves the installation of a AC

• Sharp 230 Wp module, 30.3 V DC

• Inverter Enphase Energy, 215 W AC

The inverter is connected to the internal grid of the house, which achieved a reduction in consumption. The PV System is installed since August 2012.

The facility currently does not benefit from existing regulations for distributed generation because it lacks a bidirectional counter which will be installed in December 2102. The main benefit is that thanks the PV System the consumption is less than 100 kWh / month and the going rate is the social rate.

Figure 6-4. PV Ssytem Connected to Grid

Beneficaries: Entrepreneurial Women's Association

Day of Visit: October 31, 2012



Association's Greenhouse



Tomato examples



Solar module connected to internal house grid



Consumer's bill with lower consumption since August 2012

6.5.4 Beneficiaries 4. Comunity of the micro-watershed Xeúl-Canchel

Date: November 02, 2012 Place: Xeúl – Canchel Paricipantes:

- Community Association for the Development of Las Mascaritas fall.
- Leonardo Ruíz Reyes, President
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant, FUNSOLAR
- Vicente Sis, PURE II Project community promoter in Baja Verapaz, FUNSOLAR (Cel. 53149090, <u>mailto:chentesis@yahoo.com</u>
- Rocael Mendoza, PURE Project natural resources promoter, FUNSOLAR (Cel. 48325866)
- Humberto Rodríguez, PURE external evaluator

During this visit many projects related to the four different components of the Project were visited.

Background

The organization of the Community Association for the Development of Las Mascaritas began in 2007 with the support of FS. This association consists of 336 families from five communities. Beneficiary communities are Xeul Canchel, San Vicente, Santa Rita, Choven and Pasau.

The PURE has contributed with project resources for the legalization of the association, the association training, business training for the community, watershed management, soil conservation and PF study of MHP Las Mascaritas. The association has provided manpower in all activities.

Major related studies during the meeting are as follows:

- Determination of the water potential of the area, Luis Monroy, 2007
- Business development, FUNDES, Guillermo Guzman, 2009
- PF study of MHP Las Mascaritas, Hidralia (Spain), 2010 and 2011

• Diagnosis and Comprehensive Plan for the Microbasin, SIAFSA (Agricultural and Forestry Comprehensive Services, Inc.), 2009 and 2010

• Topographical survey, Luis Monroy, 2009

During the community meeting, it was highlighted the participation of women (currently there are 3 in the partnership working very actively).

1. MHP Project, Las Mascaritas

The PF study was made by Hidralia Energia from Spain. The report was received by FS on February 06, 2012- In the report the Project is called P-H-Xeul- The main characteristics of this plant are:

Central	PH Xeul
Caudal de diseño	0.40 m3/s
Salto útil	130 m
Salto neto	121.942 m
Potencia de la Planta	400.48 kW
Producción año medio	1,735 MWh
Pérdidas por indisponibilidad (5%)	-87 MWh
Producción Neta año medio	1,648 MWh

Le financial assessment indicates the need for interconnection to the national grid (SIN) given the large amount of energy to be generated and the low demand from users, coupled with high costs for the interconnection to the national grid.

The financial evaluation considers that the project is developable with a donation of 85% of total costs and 15% would be financed with funds generated by the project.

2. Watershed management

In this activity, with the participation of 36 families, there have been 23,500 coffee seedlings and established hedgerows. 31 families have been trained on basic grains and small composting plants have been constructed with a total capacity of 36 m3.

3. Biodigestor

The project has constructed a digester type bag of 6.7 m in length. The gas produced from organic waste is used for cooking and lighting. The main advantages are according to the users, reduction of fuel consumption, fast cooking and not inhaling smoke, a combustion product.

The cost was 7000 Q (app. US\$ 875), which includes materials (plastic bags, pipes, ducts, filters), technical assistance, training. The contribution of the beneficiary was the purchase of the stove and a gas lamp, hose connection to the plant, excavation and a concrete patio. The plant is in operation since May 24, 2012 to the satisfaction of the user and serves as a demonstration plant for the whole community.

The biodigestor saves:

• 2 x 25 lb /LPG cylinder. Each LPG cylinder costs 90 Q, which corresponds to 180 Q / month, and the repayment periods would be 40 months based on LPG saved.

• Save firewood in the order of 1 monthly wood task⁵¹, which has a cost of 300 Q. In these terms the repayment in 24 months would be consistent with the benefit of not burning wood and non-inhalation of combustion products.

⁵¹ Wood task is a local firewood unit.

4. Compost

The composting unit is made of wood and has a volume of about 2 m3. The cost of each composting unit is of the order of 385 Q (1 pound worm 25 Q; 2.5 m^2 plastic 60 Q and, wood 300 Q) corresponding to approximately 50 US\$.

In the visited micro-watershed 35 have been built and in all the project's micro-watersheds a total of 96.

5. Plant Nursery

The plant nursery was used as coffee seedlings. There were 23,500 seedlings. FS provided seeds, plastic bags and training. The benefits of these plants are watershed protection, extra income, CO2 capture and reduced erosion by using perennial crops.

6. Pico Hydro Power Plant

The pico plant is of run-of-river type. From the water intake, penstock is plastic 3 inches in diameter, has a length of 90 m and a head of 20 m (the waterfall). The flow rate is about 6 liters / second.

The turbine is of the Michel Banki type, coupled directly to an automotive alternator 300 W. It employs a charge controller and charges an automotive sealed battery with a capacity of 60 Ah to 20 Hour Rate and 12 V DC. The system uses a 450 W DC-AC inverter.

The costs of the components of the pico plant are: alternator Q 700, Michel-Banki turbine Q 2,600, charge controller Q 250, battery Q800, inverter Q450, other accessories Q 300, wiring gauge 8 to the user at 200 m away Q 1,800. The total cost of Q 6,900 (US\$ 885) not including the cost of the pipe varies according to each project. The cost of the pipe as used in the project is Q19.30 / m. In the specific case of this project the cost of the pipe was Q 1,740 (US\$ 223), so that the total investment cost of the project amounted to \$ 1108, not including transportation, fees and travel expenses, nor excluding value of contributions in kind of the beneficiary.

The pico power plant is in operation since September 26, 2012 date. At the end of the project there will be 3-pico power plants installed.

For now it only supplies power to a family. The family has lighting, radio and cell phone charger.

7. Firewood Saving Stove

Using the CNE resources, saving stoves were installed of the Guatemalan manufacturing brand ONIL (more details of the stove are given in section 6.5.5). These were purchased at a cost of 1,050 Q (app. US 131) and included the equipment, transportation, installation, technical assistance and training to users.

8. Soil conservation

Soil conservation has been achieved using vetiver grass slopes, residue management (not burning the same), corn planting, drip irrigation in the cultivation and use of organic fertilizers in agricultural activities. There are in total ten plots.

9. Business Incubator

Within the development of new businesses, FS has trained community personnel in administrative matters, conducting meeting minutes, basic accounting principles, bookkeeping accounting and inventory, preparing invoices and checks, among others. This training has been very useful for example for the microenterprise of charging cellular phones.

10. Solar Panel for Charging Cellphones

This system consists simply of a solar module (not verified the capacity but the size is estimated at 230 Wp), a charge controller (SUNSAVER 20), a battery bank (2 x 6V DC TROJAN T105) and an inverter (1100 W continuous)

The evaluator believes that the system is good but is poorly installed as there are excessively long cables that produce power losses and need to be tightened. It was recommended to FS the make the required adjustments

The system was installed on November 18, 2011 and charge cell phones at 3 Q, and supplies power to a haircut machine to 5 Q. The accounts are kept properly (See Figure 6-5).

Figure 6-5. Community of Xeúl-Canchel Different projects

<u>Beneficiaries: Community of Xeúl - Canchel</u> <u>Day of Visit: November 02, 2012</u> <u>User coordinates: N15° 01' 28" W90° 35'44, 1481 m elevation</u>



Community meeting



Watershed Management Plan



Regulator, Battery bank and investor of the microcompany of cellphone battery chargers.

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Cellphone battery charging Micro-company Accounts



Biogas plant



Compost plant



Seedbeds



Charging tank for pico-power plant



300 W pico-power plant



Efficient firewood stove



Pressure tank of the drip irrigation system



PF study of Las Mascaritas MHP, 2012

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6.5.5 Beneficiaries 5. Cobán – Alta Verapaz

Date: November 3, 2012 Place: Various places near to Coban, Alta Verapáz

In places near Cobán three projects were visited. In matters of biogas were visited: Caserío Pura and the Aldea Chicujal, both in the municipality of San Juan Chamelco, A.V. In matters of stoves, the metropolitan area of the San Juan Chamelco, A.V. was visited.

Project 1. Biogas plant in the chicken fattening business.

Participants:

- Manuel Xol, Owner of chicken hatchery
- Members of the family micro-company formed by 9 members.
- Julio de La Parra, Expert in Biogas plants (Cel. 59436536, jrdelaparra@iltelnett.com)
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant, FUNSOLAR
- Omar Alfaro, PURE Project promoter in Alta Verapaz, FUNSOLAR, Cel. 40895033, mail to: omarcoban83@gmail.com
- Humberto Rodríguez, PURE external evaluator.

The family business consists of buying two day old chickens and their fattening, slaughter and marketing.

The socialization process consisted in all the work necessary for families to adopt biogas plants. We identified six potential plants but only 4 are built.

The family Xol adopted the biogas technology for its advantages: increased growth of chickens due to disease control, lower chickens mortality, fertilizer production, hatchery flaming, water heating for the slaughtering process, gas for cooking, lighting, and disposal of feces and blood.

FS hired an expert in biogas plants who advanced in the following activities: Induction, supply and installation of components, support and training for the biogas plant. The plant has a volume of 12 m3 and has a production capacity of 4.5 m3/day. Since 2 m3 correspond to 1 lb calorific value of LPG. A pound of LPG costs Q 5.5. Therefore, the value of biogas is equivalent Q 12.40 / day or US\$ 1.60/día or US\$ 48/mes of LPG.

With the gas produced they save 3 m3 of firewood per month saved, with a monthly value of US\$ 12.8 (or 100Q/month) and a higher heating value fuel is employed as calculated above.

The cost of the plant was Q10,000 (US\$ 1,280). The financing was 100% PURE and the contribution in kind of the owner.

Figure 6-6. Biogas plant in chicken hatchery

Date: November 3, 2012 Place: San Juan Chamelco, Cobán, Alta Verapaz



One-week old chickens



Biogas plant



Biogas flaming for soil sterilization



Stove burning biogas

Project 2. Biogas Plant in ecoturism center.

Participants:

- Juan Oliverio Si Tut, Center owner (Cel 53252158, <u>www.cuevasdemaxiwan.com</u>)
- Members of the family company formed by 5 members.
- Julio de La Parra, Expert in biogas plants. (Cel. 59436536, jrdelaparra@iltelnett.com)
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant. FUNSOLAR
- Omar Alfaro, PURE Project promoter in Alta Verapaz, FUNSOLAR (Cel. 40895033, <u>omarcoban83@gmail.com</u>)
- Humberto Rodríguez, PURE external evaluator

The business is an ecotourism center that includes nature observation, nature walks and restaurant service.

The socialization process consisted in all the work necessary for the owner to adopt the technology.

FS contracted a biogas plant expert who developed the following activities: Induction, supply, installation of components, support and training. The plant is of the fixed hood type, has a volume of 50 m3 and has a production capacity of 20 to 25 m3/day of biogas, which requires a load of 400 lb / day of organic material and 1 m3/day water.

The cost of the project is Q 54,158, of which the owner has contributed 25% and 75% by the PURE. The work began in June 2012 and is currently undergoing commissioning.

Figure 6-7. Biogas plant in ecotourism center in Cuevas de Ma'xivan

Date: November 3, 2012 Place: Cobán, Alta Verapaz



Touristic center



Biogas plant



Biogas plant exterior view



Two-burner stove burning biogas

Project 3. Efficient Stoves

Place: San Juan de Chamelco (Metropolitan area of the San Juan Chamelco municipality, Departament of Alta Verapaz.

Participantss:

- Gabriel Tzul Sam, Stove owner (Cel 40559538)
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant. FUNSOLAR
- Omar Alfaro, Promotor proyecto PURE en Alta Verapaz, , FUNSOLAR (Cel. 40895033, <u>omarcoban83@gmail.com</u>)
- Humberto Rodríguez, PURE external evaluator

This stove is one of the 430 stoves installed by PURE II using CNEE resources, which in turn come from an energy efficiency program from CNEE and IDB. The value of CNEE contributions were US\$ 25,000, of which US\$ 20,000 were used for the revolving fund. The PUREII using own resources and the remaining US\$ 5,000 of the CNEE, did all the work of dissemination, advocacy, information. (transfer and installation of the equipment).

According to user information, 60 bunches / month of wood were used. At present the consumption is 20 bunches / month. A bunch is about 25 lbs of firewood. Therefore, the heater 40 saves bunches / month which corresponds to 2/3 of monthly consumption or in other words, the heater consumes 1/3 the previous consumption. In economic terms, this means a saving of 40 bunches / month x Q 5 / bunch = Q 200/mes. Taking into account that the stove cost Q 960, payback period with the savings is 5 months.

A neighbor whose business is the production of processed foods has installed the stove with equal success.

The main advantages of the stove off the conventional open stove are:

- We avoid burns when preparing tortillas
- People do not get sick as before by the combustion products.
- Operates two burners simultaneously
- Consumes less firewood
- Less dirt in the environment, less smoke, less pollution in the kitchen.
- No need to buy comal that cost Q 15 / month.

A disadvantage is that as there is no smoke in the kitchen, there are more mosquitoes.

We also visited a lady that used the efficient stove for productive purposes. All food is sold in a school. The PURE objective of offering efficient technology for productive use reducing costs and GHG emissions is reached.

Figure 6-8. Efficient Stoves

Date: November 3, 2012 Place: Cobán, Alta Verapaz



Efficient stove, Brand: Onil



Combustion chamber



Smoke-extracting Tube



A bunch of firewood

6.5.6 Beneficiaries 6. Las Conchas – Alta Verapaz Community

Date: November 5, 2012 Place: Central de Las Conchas, Chahal, Alta Verapáz

Project . Las Conchas Small Hydroelectric Plant

Participants:

- Noel Contreras, ASOCALCO President (Asociación Campesina Las Conchas)
- Domingo Paquil, Vice-president
- Carlos Cuc, Treasurer
- Adela Cuz, Secretary
- Agustín Chuba, Vocal
- Juan Tzir, Vocal
- Various Members of ASOCALCO
- Virginia Rodas, PURE Project coordinator, FUNSOLAR
- Marta Cecilia Estrada, PURE Project planning, monitoring and evaluation assistant. FUNSOLAR
- Darwin García, Promotor proyecto PURE en Las Conchas, FUNSOLAR (Cel. 57872336, <u>darwin.gprado@gmail.com</u>)
- Humberto Rodríguez, PURE external evaluator

Since 2000 the community has been interested in the use of Las Conchas River. In 2002 FS visited the place identifying renewable energy projects. Since that time FS started work on bringing awareness to community members and leaders to visit other MHP. They also began to instruct the community to the formation of the Association and the formation of the cooperative ECA (Associative Peasant Enterprise). In year 2008 ASOCALCO was founded, comprising 11 communities with a total of 400 families, and received its legal status in March 2009. Before 2007, the process was supported by the Interamerican Development Bank (IDB) and FS.

For the execution of this project, FS made the first contacts with the Embassy of Japan. Subsequently the government of Guatemala through the Ministry of Environment and Natural Resources (MARN) made the request for a bilateral cooperation that included three MHPs (Las Conchas, Jolom Ijix and Seasir), which was approved on 26 January 2010. Later was the MEM who took over as project counterpart, representing the Government of Guatemala.

The implementing agency for the Japanese government was the Japan International Cooperation Agency (JICA). The execution was carried out by the Japanese company Newjec Inc. In March 2010 the execution of the project begins with the completion of feasibility studies. JICA endorsed the PF studies made by FS with GEF / UNDP funds. In relation to the plant some changes were made to the PF studies made by FS.

The MHP Las Conchas has a flow rate of 2.5 m3 / s, a fall of 5.8 m, and employs a Kaplan turbine which has a generating capacity of 94 kW (according to information from FS). The extension of the grid is 17 km at 13.2 kV and 13 km of low voltage distribution (power at 110 V). The MHP is still in

the warranty period of one year. The MHP was two months out of service and normal service has resumed on September 24, 2012.

Currently the number of users is 393 families plus 3 churches. The average consumption at present is 9 kWh / household / month. The income-expenditure balance of Administrative Unit of Energy shows a deficit because revenues are at present Q 8,000/month and the cost of employees is Q 7,700 but revenues are earmarked Q 3,900 so the operating income is reduced to Q 4,100, generating a deficit of Q 3,400. Clearly, the MHP has barely few months of service and you have to wait for the development of the repressed demand but it is urgent to develop an increasing demand by productive activities and to search new neighbor customers to which the energy can be sold to higher prices.

Specially important was the participation of FS in the entire development process of the MHP, from its beginnings in the renewable resource identification, PF study, community organization, training, the accompanying ASOCALCO throughout the whole process of legalization and obtaining the bilateral cooperation. And continues today, especially in the time that is necessary to develop productive options for the community to improve the income and seek to strengthen the sustainability of the project.

Figure 6-9. MHP Las Conchas

Day of visit: November 05, 2012



Charging chamber



Control panel



Machine Room



Transmision lines and Sub-station



Water discharge



ASOCALCO Board Members



Energy Company Administration

[No. 17] POB (0. 10 00)
Lugar Las conchas Footha 19 / 10 / 2012
Receible de Arcolas caal cooch La cantidad de: Diezciocho Poetrales Exactos
Porconcepto de Pago de Energía electrica corresponde al mes de soptiendore
hectura baterioro (1000 - 18
Addia Tralana the att The
124100 124000 12400 12400 12400 12400 12400 12400 12400 12400 12400 1240

Receipt made by the Administative Unit of Energy.

6.6 LIST OF CHECKED DOCUMENTS

The information received from FUNSOLAR is very voluminous (1308 files, 364 folders), 4.63 GB.

Tamaño: 4,63 GB (4.980.891.790 bytes) Tamaño en disco: 4,48 GB (4.810.887.862 bytes)

Contiene: 1.308 archivos, 364 carpetas

The following table shows the received files. This information will be systematized in the digital version of the report.

Table 6-2. Project Documentation



(Continued)

🖃 퉲 COATÁN III
INFORME DIGITAL COATAN FASE III
DWG CORRAL GRANDE
Guia de Términos de Referencia EIA
Informe Final Corral Grande PDF
E ESTUDIO FACTIBILIDAD LAS CONCHAS
📗 ANEXO C Planos de Obra Civil
📗 ANEXO D Est Impact Amb
📗 ANEXO E Princ Form Org
🎳 ANEXO F y G EVAL FIN y EC
🎳 ANEXO H Detalle de Costos
🗆 🌗 XEÚL
🖂 퉲 PREFACTIBILIDAD XEUL
🌗 1. MEMORIA Y ANEJOS
🖃 퉲 2. PLANOS
🖃 퉲 PDF
🌗 Auxiliar
3. PRESUPUESTO
🐌 RESTITUCIÓN ORTOFOTOGRAMÉTRICA
🖃 퉲 13. Análisis de capacidad productiva
🖃 퉬 análisis empresarial, propuestas metodológicas y herrami
HERRAM~1
PROPUE~1
PROPUE~2
🖃 퉲 XEÚL
IDENTI~1
productos- servicios estrategicos con usos actual casca
14. Manejo de los Recursos Naturales de la Cuenca
🗉 퉲 15. Incidencia y Diálogos
🖃 퉬 experiencias positivas y negativas entorno al desarrlo de
Presentaciones

(Continued)
🖃 퉲 15. Incidencia y Diálogos
🗆 퉬 experiencias positivas y negativas entorno al desarri
Presentaciones
鷆 Respuestas por comunidad
🗆 퉲 16. Inversión
퉬 revision, analisis y evaluacion de los proyectos
🗆 퉲 Estimación de Reducción de Emisiones
🖃 퉲 Green Development
🖃 퉲 GEIPURE actualizado
🕕 Debug
🖃 퉲 ESTUDIO PREFACTIBILIDAD COATAN III
📗 ANEXO 3 Formulario EIA Inicial
📗 ANEXO 4 Data Cruda Estación Cunlaj
📗 ANEXO 5 Memorias de Cálculo
📗 ANEXO 6 Planos de Prefactibilidad
📗 INFORME FINAL ENTREGA F. SOLAR - COATAN III
퉲 Implementación
EVALUACION INTERMEDIA
퉲 EMT 2009
🗉 퉲 Indicadores Componente 1
🕀 퉲 Indicador 9
🕀 퉲 Indicador 10
🕀 퉲 Indicador 11
🕀 퉲 Indicador 12
🕀 퉲 Indicador 13
🗆 🌗 Indicadores Componente 2
🕀 퉲 Indicador 14
🕀 퉲 Indicador 15
🕀 퉲 Indicador 16
🗉 🌗 Indicadores Componente 3
🕀 퉲 Indicador 17
🗉 퉲 Indicador 18
🗉 퉲 Indicador 19

(Continued)
Tradicadores Componente 4
Indicador 21 Demodes page indución en calítica prespólitor 2012
Borrador para inclusion en política energetica 2013
Propuesta reforma al dec. Gub. 211-2005
Indicador 22
Entregables Consultoria Inscripcion de proyectos de ER e
PDD Chel
D Indicadores Global
Indicador 1
GEIPURE actualizado
Indicador 2
JOLOMIJIX
LAS CONCHAS
SEASIR SEASIR
🎍 Indicador 3
🎍 Indicador 4
📗 Análisis de capacidad empresarial LAS CONCHAS
📗 Análisis de capacidad empresarial XEÚL
📔 CHIBALÁM
🌗 Indicador 5
📔 Reuniones de Comité de Acompañamiento
퉬 Indicador 6
🌗 Indicador 7
📔 Editoriales ElGreenTimes
🌗 Presentación Estrategia Multisectorial
📗 XVII FORO REGIONAL ALIANZA AMBIENTE Y ENERGÍA
🌗 Indicador 8
📗 Convenios Acuerdos Xeúl
📗 legalización Las Conchas

(Continued)	

INFORMES DE AUDITORIAS
📗 AUDITORIA 2010
AUDITORIA 2011
📗 AUDITORIA PURE 2008
📗 AUDITORIA PURE 2009
INFORMES PIR
🌗 PIR 2007 2008
퉬 PIR 2008 2009
퉬 PIR 2009 2010
퉬 PIR 2010 2011
퉬 PIR 2011 2012
INFORMES TRIMESTRALES
June 2007
J008
July 2009
2010
Juli 2011
Juli 2012
DF-B
PLANES OPERATIVOS ANUALES
PLANES OPERATIVOS TRIMESTRALES
June 2007
J008
July 2009
June 2010
Juli 2011
Juli 2012
PRODOC
📗 Reuniones de Comité de Acompañamiento
January 1. 12. 2011
10.11.2010
17.04.2012
26.09.2012
30.11.2009
31.03.2011
Revision sustantiva

6.7 COMMENTS

The purpose of this section is to show the comments made to the report by UNDP-Guatemala and FUNSOLAR and by the Regional Technical Advisor of the UNDP-GEF

6.7.1 Comments by the UNDP –Guatemala and FUNSOLAR

This report in draft form was submitted to UNDP Guatemala and to FUNSOLAR on December 17, 2012. The UNDP and FUNSOLAR comments were consolidated in one document and were received by the consultant on January 16, 2013.

This section displays all the comments and refers them to their respective document page. The response is given and action taken.

<u>Comment 1</u>. Page 1-1 "Please state how the analysis was done and how the information was gathered"

Answer. The review consisted of an analysis of PRODOC, the PIR, the substantive review of the project and the determination of the key factors in which the evaluator should focus, all linked to the achievement of the objectives and the implementation and execution of the same . Response incorporated into the text.

<u>Comment 2</u>. Page 1-2 "Describe a bit more giving follow-up to the comment"

Answer. The information gained during the mission was analyzed to determine the degree to which objectives were achieved and the project was implemented and how the project was implemented. Response incorporated into the text.

Comment 3. Page 2-1 "Could add data and dates"

Answer. They will be added to the extent they are available

<u>Comment 4</u>. Page 2-1 "Peace agreements?"

Answer. Peace Agreements established in the nineties decade were considered an important factor in the Project formulation, according to PRODOC. Text has been left as it was.

<u>Comment 5</u>. Page 2-4 "Order the information, this Project objective could go in section 2.6 Project Objectives"

Answer. It is considered convenient to leave the Project's General Objective where it is to facilitate the context for the readers. Section 2.6 refers to the specifics. Text location has been left where it was.

<u>Comment</u>. Page 2-6 "See previous comment for the correct time calculus."

Answer. Corrected. Answer incorporated into the text.

Comment. Page 2-6

"The project strategy initially sought to implement hydroelectric plants, which carry a social, organizational and knowledge transfer much more extensive and complex than other technologies. This was not considered within the PRODOC. However, from 2010, the strategy is reoriented to seek to implement the other TERs, which accelerates the execution step."

Answer. Answer incorporated into the text.

<u>Comment</u>. Page 2-7 "Modify the final execution term"

Answer. Table modified and incorporated into text.

<u>Comment</u>. Page 2-7 "Where did the objectives come from?"

Answer. PRODOC (Spanish version), Abstract, Page 1. Answer incorporated into text.

<u>Comment</u>. Page 2-12 "Report timetable"

Answer. The times in the report have been corrected.

<u>Comment</u>. Page 2-18 "Is there any description of the project's indicators and monitoring missing?"

Answer. Paragraph 2.8 on indicators was added and its importance for monitoring and evaluation. Final indicators used in this assessment are set out in the substantive review of the project and are used in Chapter 3.

<u>Comment</u>. Page 3-2 "Has been partially achieved: Development of 451 kw approximately with the 3 hydroelectric plants donated by Japan, etc."

Answer. It was incorporated into the text.

Comment. Page 3-4

"Government officials who signed the letters of intent, also were dismissed (if not wholly, mostly) because the incumbent government (Oscar Berger), ended his term in December. 2007. The project went through two changes of government, which influenced the active participation of committee members accompanying"

Answer. But also the continuity of government officials initially involved with the project was lost as these were replaced because the project went through two changes of government. Answer incorporated into the text.

Comment. Page 3-7

"Clarify that Izabal is not in the project's influence areas, however its closeness with some towns which are in the area (Chahal, Panzós of the Alta Verapaz department), it was considered and improved stoves were implemented"

Answer. This clarification was added in the footnote. <u>Comment</u>. Page 3-8 "Following, monitoring and Project management. Please include this role and the sustaining following."

Answer. It was incorporated in the text in section 3.1.4.

Comment. Page 3-11

"Upon the evaluation date of the Project there must have: 3 trimestral reports, 4 trimestral operational plans. The APR-PIR are from July to June, the 2012 PIRE is from JULY 2011 to JUNE 2012"

Answer. The evaluator has considered the reports and the received trimestral operational plans. The observation is correct that the 2012 PIR goes from July 2011 to June 2012 and the table has been corrected.

Comment. Page 3-12

"The word 'agency' could cause confusion when trying to imply other agency from the United Nations System. For Example: FAO, UNICEF, etc."

Answer. The word 'organization' has been used in the text.

Comment. Page 3-15

"Please state which the partner agencies are. And others."

Answer. This clarification is related with Table 3-2, it was added to the report.

Comment. Page 31-5

"JICA's donation was to the GoG would not be worth mentioning this too? The contribution referred to as "tax exemption" is only the cash contribution. The in-kind is not accounted"

Answer. This clarification is related with Table 3-2, it was added to the report. The in-kind is accounted.

Comment. Page 3-16

"Be careful with the terms. The FS did not execute the co-financing money. It only executed the GEF amount. The co-financing is handled by each partner organization. GEF funds are "incremental" – "catalysts" of resources that the country has (public or private – cooperation)."

Answer. Clarification included in text.

Comment. Page 3-18

"I suggest mentioning the strengthen and created municipality-community associations."

Answer. Added into the text.

Comment. Page 3-23

"These are the assessed in the 2011-2012 PIR there's the name of all the municipalities and associations with which agreements and understanding letters were formulated."

Answer. The evaluator has specified the text by considering the projects he visited but doesn't have any better information.

Comment. Page 3-24

"In the substantive revision it changes the 'implementation' for 'identification'

Answer. In the qualification the implemented has been considered and the possibility that the identified projects could be made has been noted.

<u>Comment</u>. Page 3-28 "In the 3 micro-regions: Jolomijix, Seasir and Las Conchas"

Answer. The 3 micro-regions have been included.

Comment. Page 3-

"There are factors that hinder the implementation of these projects with feasibility studies: Corral Grande, Los Coatanes and Mayagua are municipal projects, which have mostly difficulty obtaining financing, being of public and not private nature. Among these we may mention that by law, the acquisition of municipal debt cannot affect the next administration, which is to be able to settle in the 4 years that is the government. The rest are on private land, which often lack the certainty of land tenure (as they are for or possessory rights were awarded to communities through governmental agreements) and therefore often lack the guarantees required formal banking system to provide credit. Herein lies the importance of public-private or private-community, but the regulatory framework around them is still weak, and there are no clear patterns that provide equitable benefits to both the private developer and the community."

Answer. Observation added to the text.

<u>Comment</u>. Page 3-38 "The trip won't be done"

Answer. A meeting with the Board for the results' presentation will be done, however this trip won't take place. Clarification added to the text.

<u>Comment</u>. Page 3-38 Projects registration to the Clean Development Mechanisms.

Answer. It will be done by the representative of each Project. Clarification added to the text.

Comment. Page 3-41

"For hydroelectric plants technologies that may be true. But for the other (photovoltaic systems, stoves, and biogas digesters) are experiences that show that beneficiaries understand the cost benefit relationship of investing in these technologies".

Answer. Valid comment. Included in the text.

Comment. Page 3-42

"Other types of markets with RETs with much less scale were identified."

Answer. Indeed if it was shown that smaller projects are viable for users. The best example is that of the stoves where users used the revolving fund. But as a result of the project there have not been operational financial mechanisms to which users can turn to give continuity to the successful cases (stoves, recharge cellular systems, biogas plants.

<u>Comment</u>. Page 4-3 "Administrative Handbook for Community Hydroelectric Projects"

Answer. It has been removed since it's validated and has been socialized in 3 regions where JICA donated projects.

Comment. Page 4-3

"Registration of at least 4 projects in the Clean Development Mechanism (Carbon markets)"

Answer. It was deleted since it is a task of the Project promoters and not of FUNSOLAR.

6.7.2 Comments by the UNDP-GEF Regional Technical Advisor

The UNDP-GEF Regional Technical Advisor formulated comments about the report's Spanish draft version 1.0 (December 15, 2012), which were received on January 29, 2013. The comments had already been solved in Version 2.0 submitted to UNDP-Guatemala on January 27, 2013.

This section shows all the comments and refers them to the page of the Spanish Draft Version 1.0. The answer or action taken is given.

Comment. Page i

"The evaluation criteria on the Project relevance as well as its effectiveness (not to be confused with cost-efficiency) are missing in the report's structure, or not clearly identified. It is necessary to include a specific section for each criterion, in line with the UNDP-GEF evaluation guidelines (see UNDP-GEF-TE-Guide.pdf document). On the other hand, the report has to include risk and sustainability "ratings" as stated in those guidelines. I suggest comparing the recommended structure of the report (Annex F of the guidelines mentioned previously)".

Answer. The project's efficiency aspect has been considered and graded in terms of the global environmental outcomes of the project. These have been included in section 3.2.3.

Comment Page 3-7

"See comment in the outcomes section about the need to summarize in a table or matrix all the ratings. It is recommended to begin with an introduction-summary of all the implementation ratings, which would later be detailed, or at least a table. This would facilitate a global view and follow up of the report, given its length".

Answer. This table had already been made for Version 2.0 of the Report. The suggestion to insert it at the beginning of Chapter 3, Outcomes Evaluation, is accepted.

<u>Comment</u>. Replicability "What is the rating of this criterion?"

Answer. The rating of this criterion is given in section 3.2.4.

<u>Comment</u>. Project Effectiveness "What is the rating of this criterion?"

Answer. The rating of this criterion is given in section 3.2.5.

<u>Comment</u> Page 3-16 "This figure has to be clarified or compared with 8.7 previously given, in order to avoid confusions".

Answer: The correct number is 8.7 and it has thus been consolidated in the report.

<u>Comment:</u> Sustainability "Rating?"

Answer: The rating is this criterion is given in section 3.2.7.

Comment: Section 3.3 Outcomes

"Please include a matrix or summary table of all the ratings by evaluation criteria at the beginning or end of each section. An overall assessment of the ratings that supports the overall project rating has to be made. (See previously mentioned guideline)".

Answer: A summary table that was already presented on V2.0 has been moved to the beginning of Chapter 3. This same table is found at the end of the Executive Summary.

<u>Comment:</u> Page 3.20 "Replicability Factor?"

Answer: Reduced emissions have been calculated based on executed, identified progress and projects which have reached prefeasibility. It is clearer to consider emissions of each of the projects before considering a factor that implies replicability of executed progress, and then consider in a future time horizon the execution of a percentage of the projects.

6.8 DVD WITH FULL REPORT

It contains the reports and complete Project information.

This DVD will be attached to the final printed version.

6.9 UNDP MANAGEMENT RESPONSE TEMPLATE

[Productive Uses of Renewable Energy in Guatemala (PURE)] Date: 02 February 2013 PIMS No. 3186 (ATLAS Proposal N.00043790-ProjectN. 00051216)

Prepared by: Humberto Rodriguez	Position: External Evaluator	Unit/Bureau:
Cleared by: Nelly Herrera	Position: UNDP Monitoring and	
	Evaluation Official	Unit/Bureau:
Input into and update in ERC:	Position:	Unit/Bureau:

Overall comments: The project is in its final stage and should release to the public valuable documents and, close administrative processes

Evaluation Recommendation or Issue 1: Check the completion of the studies				
Management Response: Verify compliance of this recommendation by FUNSOLAR				
Key Action(s): Finish up following consultancies:	Time Frame	Responsible Unit(s)	Tracking*	
			Status	Comments
1.1. Systematization of the Utility of San Pedro Sacatepequez	February – March 2013	FUNSOLAR	In progress	
1.2 Analysis of the impact of the implementation of the TER	February – March 2013	FUNSOLAR	Finished	
1.3 River basins management techniques	February – March 2013	FUNSOLAR	Finished	
1.4 Energy generation through biomass (municipal solid waste	February – March 2013	FUNSOLAR	Finished	
Evaluation Recommendation or Issue 2 Collect documents duly				
completed of agreements between FUNSOLAR and all				
beneficiaries				
Management Response: Verify compliance of this				
recommendation by FUNSOLAR				
Key Action(s) . Document agreements made with all beneficiaries,	Time Frame	Responsible Unit(s)	Track	ing
duly signed			Status	Comments
2.1. Document agreements made with all beneficiaries, duly signed	February – March 2013	FUNSOLAR	Finished	
Evaluation Recommendation or Issue 3:Legalization of				
transferred goods				
Management Response: Verify compliance with of this				
recommendation by FUNSOLAR				
Key Action(s) Formalize (legalize) the transfer of goods and services	Time Frame	Responsible Unit(s)	Track	ing
provided to all beneficiaries, according to UNDP procedures	February – March 2013	FUNSOLAR	Status	Comments

Evaluation Recommendation or Issue 4: Lessons learned systematization			In progress	
Management Response: Check with FUNSOLAR termination and uploading of the material to the web for dissemination			In Progress	
Key Action(s) Systematize lessons learned from PURE, Printing and	Time Frame	Responsible Unit(s)	Tracking	
Socialization Practices Manual, upload project information to the web site of FUNSOLAR	February – March 2013	FUNSOLAR	Status	Comments
3.1 Systematize lessons learned			In Progress	
3.2 Recommended Practices Manual – Final Editing and Printing (electronically)			In Progress	
3.3 Upload project information to the web site of FUNSOLAR			In progress	Will be finished once the project is over.
Evaluation Recommendation or Issue 5: Perform the final audit				
Management Response: Audit contract				
Key Action(s) Performing financial audit (January-February 2013)	Time Frame	Responsible Unit(s)	Tracking	
	March 2013	UNDP Guatemala	Status	Comments
Evaluation Recommendation or Issue 6: Final Report preparation by FUNSOLAR			In progress	PIR 2012- 2013 In formulation process.
Management Response: Verify the compliance of this obligation by FUNSOLAR				
Key Action(s) Prepare the Final Project Report.	Time Frame	Responsible Unit(s)	Track	ing
	March 2012	FUNSOLAR	Status	Comments
Evaluation Recommendation or Issue 7: Perform project closing event			In progress	WilltakeplaceonApril10,2013
Management Response: Contribute to the realization of the event with FUNSOLAR				
Key Action(s) Closing Event: Presentation of the final evaluation	Time Frame	Responsible Unit(s:	Tracki	ng
results and lessons learned with PURE	March 20131	FUNSOLAR, UNDP Guatemala	Status	Comments
3.1 Closing event			In progress of	Will take
			organization.	place on April 10, 2013

LAST PAGE OF THIS REPORT