Global Environment Facility (GEF)

United Nations Development Programme

Government of Timor-Leste

TERMINAL EVALUATION REPORT

Promoting Sustainable Bio-energy Production from Biomass (SBEPB) in Timor-Leste

UNDP PIMS no.: 4250; GEF PMIS no.: 4344

TIMOR-LESTE
GEF-5; GEF Climate Change Mitigation; CCM #3 to Renewable Energy – Promote investment in renewable energy technologies
Evaluation timeframe: May 2016 – January 2020

DRAFT version

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Disclaimer

Please note that the analysis and recommendations of this evaluation report do not necessarily reflect the views of the United Nations Development Programme, its Executive Board or the United Nations Member States. This publication reflects the views of its authors.

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ANER	National Renewable Energy Agency
AWP	Annual Work Plan
CEO	Chief Executive Officer
CEO ER	CEO Endorsement Request
CNEFP	National Centre for Employment and Professional Training *(Centro Nacional de Emprego e Formação Profissional)*
CNRT	National Congress for Timorese Reconstruction
CO	Country Office
$CO_{2\text{-ea}}$	Carbon dioxide (equivalent)
CSO	Civil society organization
DIT	Dili Institute of Technology
EA	GEF Executing Agency (UNDP Implementing Partner)
EDTL	Electricity of Timor-Leste *(Electricidade de Timor Leste)*
EE	Energy efficiency
EoP	End of project
ESMAP	Energy Sector Management Assistance Program
FRETILIN	Revolutionary Front for an Independent East Timor
GACC	Global Alliance for Clean Cookstoves
GEF	Global Environment Facility
GHG	Greenhouse gas
GJ	Gigajoule (= 1 billion Joule)
GWh	Gigawatt-hour (= 1 billion Watt-hour)
IA	GEF Implementing Agency
IAP	indoor air pollution
ICS	improved cookstove
kg	kilogram
$ktCO_2$	Kilotons of CO_2
ktoe	kiloton of oil equivalent
kWh	kilowatt-hour
LPG	liquified petroleum gas
LULUCF	land use, land-use change and forestry
M&E	Monitoring and evaluation
MAF	Ministry of Agriculture and Fisheries
MFI	micro-finance institution
MoPW	Ministry of Public Works
MTR	Mid-Term Review
MW	Megawatt (= 1 million Watt)
NDC	Nationally Determined Contributions
NDF	National Directorate of Forestry
NGO	Non-governmental organization
OECD	Organisation for Economic Cooperation and Development
PIF	Project Identification Form
PIR	Project Implementation Review
PMU	Project Management Unit
PSC	Project Steering Committee
RE	Renewable energy
RTA	Regional Technical Advisor

SBEPB	Sustainable Bioenergy Production from Biomass
SDG	Sustainable Development Goal
SSE	State Secretariat for Electricity
TE	Terminal Evaluation
ToR	Terms of Reference
tCO_2	Ton of carbon dioxide
TRAC	Target for Resource Assignment from the Core (budget)
UNDP	United Nations Development Programme
UNFCCC	UN Framework Convention on Climate Change
USD	United States dollar
WB	World Bank

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EXECUTIVE SUMMARY

Project Title:	**Promoting Sustainable Bio-energy Production from Biomass (SBEPB) in Timor-Leste**			
GEF Project ID: PIMS	4344 4250		*Committed at endorsement (USD)*	*Realized co-financing / spent GEF budget at End-of-Project (USD)*
UNDP Project ID:	77146 /88130	GEF financing:	1,743,000	1,653,811
Country:	Timor-Leste	IA own (UNDP):	620,000 (core) 150,000 (social business)	261,000
Region:	South-East Asia	Government:	5,510,000	850,000
Focal Area:	Climate Change	Others (private):	470,000	310,000
FA Objectives, (OP/SP):	CCM #3: Renewable Energy – Promote investment in renewable energy technologies	Total co-financing:	5,660,000	1,421,000
Executing Agency:	UNDP (DIM: (direct implementation modality)	Total Project Cost:	8,393,000	3,164,000
Other Partners involved:	Ministry of Public Works Ministry of Agriculture and Fisheries	GEF approval:	9 May 2016	
		ProDoc signature (date project began):	May 2014	Implementation started in Jan 2016
		(Operational) Closing Date:	May 2018	Actual: 31 March 2020

Description of the Project

Most households in Timor-Leste use traditional open fires as the main cooking method. Most firewood for household use is collected by household members. Traditionally, cooking takes place mainly in cooking huts, leading to adverse impacts on public health from indoor air pollution associated with the use of fuelwood in traditional cookstoves. The cookstove industry is in a very elementary stage with small scale clay cookstove producers and a few electric and LPG stove importers in the larger cities. Solutions have been piloted on a trial-and-error basis in previous donor-supported projects, but with little capture of iterative learning and limited understanding of underlying consumer segment needs and their willingness and ability to pay. Often, following project completion, beneficiaries reverted to traditional cooking methods once their pilot stove broke and replacement stoves or maintenance services were unavailable.

To fill the above-mentioned barriers, the *Sustainable Bioenergy Production from Biomass (SBEPB) Project*, with the support of the Global Environment Facility (GEF), the Government of Timor-Leste (GoTL), the United Nations Development Programme (UNDP) and other funding partners. The Global Environmental Facility (GEF) has provided most of the financing with a USD 1,743,000 contribution, which is supplemented with co-financing by UNDP and planned co-financing from government, private sector companies and NGOs. Based on the above strategic considerations, the Project focuses on three major components as follows:

1: Policy and Institutional Support for Deployment and Commercialization of Advanced Bio-energy Technologies.
2: Bio-energy Investments Promotion; Sustainable Bio-energy Technology Demonstration & Market Development
3: Capacity Development and Market Transformation

Achievements – summary

Project outcomes

Under Component 1, the Project decided to broaden the original scope of bioenergy policy and planning to renewable energy in general, in line with government objectives to increase the share of renewables in the country's energy mix. In this context, the Project supported the draft of the Renewable Energy Law. However, the Law remains under discussion and is not likely to be approved by the Council of Ministries given the situation of the volatile political situation that has existed since 2017. Also, the planned BERIS (Biomass Energy Resource Information System) is still only starting to be developed and will not be finalized before the end of the Project. With little evidence on future government commitment, the TE Team rates the Component as 'moderately unsatisfactory'.

One achievement has been the realization of local development plans in ten *sucos* (villages) that include plans on biomass and clean cookstoves. The project also introduced a model biogas plant the vocational training institute CNEFP (considered a successful pilot), and which created interest from the government to follow up with a biogas plant support program.

Under Component 2, the project has achieved the goal of surpassing the target of 20,000 stoves with over 100 stoves (distributed by February/March 2020). However, this could only be achieved with a high level of subsidy on the stoves at 80% (and sometimes more), while the original project design had planned a decrease over time to 50%. This does not bode well for sustainability. Hence, we rate as 'moderately satisfactory'. In the last round of stove dissemination (until the end of the Project), stoves will be sold with 50% to see if the market is willing to pay half of the cost price for the stove. The interviews with stakeholders indicate that this may not be the case.

A new partnership was developed with Jeju Island authority (the island forms a province of the Republic of Korea), the "Jeju-Timor Leste Friendship Forest Project (2017-2019). A total of 6 hectares of the forest was planted in close partnership with Forest Department, Liquica Municipality Administration, and with local communities.

Under Component 3, promotion campaigns on clean cookstoves concentrated on community radio channels (which have a very high penetration rate in rural areas). 'Satisfactory' results are achieved in training entrepreneurs and technicians.

External factors

A number of activities were removed at project inception. For example, it was noted that in urban areas, there is little use of fuelwood in industrial applications since fuelwood is costly and alternative fuels such as LPG but also (subsidized) electricity is readily available. Consequently, the target of 400 industrial stoves was removed, and the number added to the original household/institutional stove target of 19,600 thus reaching the total endo-of-project target of 20,000.

The project's implementation period (2016-2020) has coincided with a situation of political instability since 2017 with two elections, caretaker governments, political bickering between parties, and delays in state budget approval. In such a volatile situation, the Government has not been able to make commitments to bioenergy. Thus, the Renewable Energy Law remains in draft form until approved by the Council of Ministers. Government co-financing has not been forthcoming. The instability has been one reason for then very late start of the Project; approved in 2014, project activities only started in 2016.

The delay of almost 2 years has also had implications for UNDP co-financing. Reduced financial resources in the project as a result of financial constraints in the UNDP Country Office in the reduced allocation of TRAC funds to the project, while the envisaged links with the UNDP 'Social Business' project did not materialize as this project ended before SBEPB started operations.

Project design and strategy

The project was designed at very high ambition levels. The initial situation was characterized by low capacity at the institutional level and limited technical-managerial capabilities at the level of the producers in a market with changing market conditions (increased supply of LPG and electricity access expansion) and consisting of end-users that had been accustomed to getting 'free' stoves. The expected end-situation was too optimistically sketched in the Project Document and its results framework has various inconsistencies and a list of ambitious deliverables whose elaborateness does not correspond to a medium-size GEF project.

The project seems to try to achieve in four years what successful countries have only achieved over 10-15 years. The ambition levels in terms of end-of-project indicators and types of activities should have been defined in such a way that clearly reflects the status of the market of wood stove supply and demand and that can be achieved in a least-developed economy in a relatively short period of a couple of years. One example is the trivialization in the project design of the issue of the low ability to pay of end-users that typically belong to the poorest in Timor-Leste and a low willingness to pay a created after years of donor-driven stove projects with almost 100% subsidy. A market of more middle-class end-users may have existed at project conceptualization, but the more widespread availability of LPG and fast-progressing electrification has implied that such groups may prefer modern stoves rather than wood-based, with wood purchases in (peri-)urban areas being relatively expensive.

Another challenge from the Project Document arises from the ambition to get substantial financial instruments delivered with the Project. These were supposed to be implemented through a government agency or a non-government entity such as a financing institution. However, financial commitments from government entities could not be achieved due to the volatile political situation, while there seems to have been no consultation with the financial institutions targeted for these financial instruments at project design, while at inception these showed little interest. These instruments such as a loan risk guarantee scheme should have supported the business development of stove producers in an environment of increasing commercialization, which has not happened as woodstoves have continued to be sold at an 80% subsidy level or higher.

Project implementation

Given the difficulties in getting the project started, volatile political situation, diminishing co-financing and over-optimistic project design, project management reacted with adaptive management. The project results framework was reformulated with less ambitious goals and the activities related to setting up financial instruments were canceled, thus releasing budget for other project activities. The stove distribution model was changed to have the cookstove producers (or retailers) more directly involved in stove sales, and consequently, the target of 20,000 could be reached. Given the above consideration, the TE Team rates, 'project implementation and execution' as 'satisfactory'. The reader should note that the project has been implemented in 'direct implementation modality' (DIM), in which UNDP has been the GEF Implementing Agency (IA) also acting as the 'Executing Agency' (EA).

Conclusions

The GHG emission reduction target has been achieved. While the original ambitious goals of the Project could not be achieved, the Project has made some very first steps towards more creating a more commercial approach by producers, away from the 'free' stoves in donor-driven interventions in the past.
The market uptake of stoves at prices closer to their production cost remains uncertain and doubts on the end-user willingness and ability to pay remain. The UNDP/GEF SBEPB Project can be judged as having moved the improved cookstove business towards a more widespread deployment but follow-up technical and financial support will continue to be needed to ensure the sustainability of results.

Rating – summary

1. Monitoring and Evaluation	*rating*	2. IA& EA Execution	*rating*
M&E design at entry	U	Quality of UNDP Implementation and Execution (DIM modality)	S
M&E Plan Implementation	S		
Overall quality of M&E	*MS*	*Overall quality of Implementation / Execution:*	*S*
3. Assessment of Outcomes	**rating**	**4. Sustainability**	**rating**
Relevance	R	Governance and institutional	ML
Effectiveness	MU	Socio-economic	MU
Efficiency	S	Financial	MU-ML
Overall Project Outcome Rating	*MS*	Socio-environmental:	L
5. Project design	**rating**	*Overall likelihood of sustainability:*	MU
Project design and strategy	*U*		

Ratings for Outcomes, Effectiveness, Efficiency, M&E, IA&EA Execution

6: Highly Satisfactory (HS): no shortcomings
5: Satisfactory (S): minor shortcomings
4: Moderately Satisfactory (MS)
3. Moderately Unsatisfactory (MU): significant shortcomings
2. Unsatisfactory (U): major problems
1. Highly Unsatisfactory (HU): severe problems

Additional ratings where relevant:
Not Applicable (N/A)
Unable to Assess (U/A)

Sustainability ratings:

4. Likely (L): negligible risks to sustainability
3. Moderately Likely (ML): moderate risks
2. Moderately Unlikely (MU): significant risks
1. Unlikely (U): severe risks

Relevance ratings
2. Relevant (R)
1. Not Relevant (NR)

Impact Ratings:
3. Significant (S)
2. Minimal (M)

Recommendations

1. *Final SBEPB project activities: end-user survey and evaluation on the 50%-subsidy round of selling stoves.*
   There is still a need to demonstrate that there is a market in rural areas for clean cookstoves sold at lower subsidy levels, or there are maybe other markets (institutional, urban poor). The last round of selling stoves at a 50% subsidy may give this information. It is suggested that the remaining Project funds are used to carry surveys to gather information on the willingness and ability to pay and on experiences of end-users with the 21,000 stoves that have been distributed**.**

2. *Government commitment to promote bioenergy (and ICS in particular)*
   Once the political situation has stabilized, post-project activities (where and if possible, supported by UNDP) should focus on getting the RE Law approved with the Government making appropriate budget available for implementation of the Law, e.g., by funding (with support by other development partners) bioenergy, bio-briquetting, solar and other renewable and rural energy programs. Rather than subsidizing technology, another way forward would be to back up finance (loans, guarantees) for business development, i.e. for producers to innovate and expand and for producers/businesses to set up marketing and distribution channels. Another funding path is to financially support local government to implement local renewable energy development plans

3. *Improve coordination between government, development partners and private sector*
   A woodstove association needs to be set up by stove producers and retailers (and possibly with wider stakeholder membership, including development partners and NGOs) to enable learning from past experiences, share lessons learned, cooperate in carrying out surveys and assessments, and coordinate funding

and program planning. The association could also be a vehicle for future government and/or donor-supported projects to deliver with training for producers on cookstove innovation and business development, raise awareness and facilitate its private sector members to set up marketing, distribution and after-sales support channels.

4. *Follow-up program*
   To ensure the sustainability of results, the Government's longer-term commitment (setting targets and making budget available) is needed. To not to lose the momentum created, the TE Team suggest formulating a two/three-year *follow-up project* with the following elements
   - Pilot activity with stove producers in disseminating stoves with subsidy (of 50% or less). This will provide important info regarding willingness and ability to pay;
   - Market assessment to understand better the demand side, encompassing:
     - Results of stove dissemination under SBEPB (which had a subsidy of 80% or more, and the results of the pilot activity with selling stoves up to 50% subsidy;
     - Exploring new market segments other than the rural poor, including institutions (e.g. rural schools:
     - Situation and constraints in the supply side sector (technical and business skills, capacity in marketing and setting up distribution), including comparative advantages and disadvantages of using fuels (electricity, LPG, fuelwood), comparing initial costs of cooking devices, monthly fuel expenditure, and availability/accessibility;
   - Drafting of a larger 'cleaner cooking fuel' proposal (in consultation with other funding and development partners as well as local stakeholders), which should implement activities in a holistic approach on policy and planning, funding and coordination, market assessments and evaluation, promotional activities and awareness-raising, training and technical and business capacity strengthening of stove producers, customer-oriented design improvements and building distribution networks (in which stoves are not just sold but marketed and with after-sales service provided). There may still be a need for an initial subsidy (40% or less) but this should decrease over time in a structured manner. Instead, external funds (from Government and development partners) can be better used to set up a (micro-)finance component to help to function the cookstove supply system (marketing, distribution, sales, and after-sales services).

Lessons learned

a. *Project formulation and design*

GEF projects have a limited duration, typically between 3-5 years). However, such a short period seldom coincides with the length of decision-making at the government level where political influence and discussions need a much longer timeframe. Another observation is that for a project that intervenes in existing markets with proven technology, it is much easier to have a market transformation impact than in beginning and uncertain markets where technology still needs to be successfully demonstrated (like the stove market in Timor-Leste). Thus, the design should reflect the market and technology innovation situation and this may imply that the ambition for outcomes and progress indicators may be more modest in comparison with similar projects in other (more advanced) countries. However, the project design in the case of SBEPB Timor-Leste has shown a tendency towards over-ambitious goal formulation.

b. *Cookstove programs in Timor-Leste*

Donor-funded intervention on wood stoves in Timor-Leste has been 'project-by-project' with efficient stove solutions piloted on a trial-and-error basis, but with little capture of iterative learning and limited understanding of underlying consumer segment needs. Market demand tends to be over-estimated. While end-users can be convinced of the health benefits (especially when cooking indoors), ease of cooking and time-savings in wood collection, they balance these pros against the con of costs of acquiring the stove. Most efficient stove programs are successful in countries and/or in market segments that have to pay for firewood

(or charcoal) so that the end-user experiences a clear monetary benefit. Also, the arguments of reducing time for wood collection and on deforestation may not be convincing enough in a situation where there is still an abundance of wood. In this context, the SBEPB has made some first steps towards developing solutions that address consumer needs without just giving stoves away for free and first commercialization of the stove business. Trying to change the mindset of users and producers away from grants and subsidy, however, will need a longer-term approach of 10-15 years.

1. INTRODUCTION

1.1 Purpose of the Terminal Evaluation and objectives

1.1.1 Background

Most households in Timor-Leste use traditional open fires as the main cooking method. Most firewood for household use is collected by household members. Traditionally, cooking takes place mainly in cooking huts, leading to adverse impacts on public health from indoor air pollution associated with the use of fuelwood in traditional cookstoves. Also, cooking at institutions in rural areas (e.g., schools) still rely on inefficient traditional stoves. Some initiatives have been started in the past by development organizations to introduce improved cookstoves in the country. Reportedly there is interest in trying alternative ways of cooking, but willingness (and ability) to pay limitations, cooking traditions and preferences, and a general lack of knowledge in communities about fuel-efficient stoves these have not led yet to widespread dissemination of efficient woodstoves.

The cookstove industry is in a very elementary stage with small scale clay cookstove producers in a few rural areas and a few steel electric and LPG stove importers in the larger cities. Solutions have been piloted on a trial-and-error basis in previous donor-supported projects, but with little capture of iterative learning and limited understanding of underlying consumer segment needs, and often, following project completion, beneficiaries reverted to traditional cooking methods once their pilot stove broke and replacement stoves or maintenance services were unavailable.

In order to fill the above-mentioned barriers, the *Sustainable Bioenergy Production from Biomass (SBEPB) Project*, with the support of the Global Environment Facility (GEF), the Government of Timor-Leste (GoTL), the United Nations Development Programme (UNDP) and other funding partners. The Global Environmental Facility (GEF) has provided most of the financing with a USD 1,743,000 contribution, which is supplemented with co-financing by UNDP and leveraged co-financing from private sector companies and NGOs.

1.1.2 Purpose of the Terminal Evaluation (TE)

With the SBEPB Project's closure date approaching, a Terminal Evaluation (TE) needs to be undertaken of the project per UNDP and GEF Monitoring and Evaluation (M&E) policies and procedures. The TE must be carried out by independent consultants, i.e. not previously involved in project design or implementation. In a competitive process, two experts were chosen to undertake the Terminal Evaluation, Mr. Johannes (Jan) VAN DEN AKKER (Netherlands) and Mr. Eurico Ediana DA COSTA, hereafter referred to as the "TE Team" or as the "Evaluators".

The evaluation has assessed the performance of the SBEPB Project, based on expectations set out in the project logical framework (a.k.a. as results framework), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation has covered the criteria of relevance, effectiveness, efficiency, sustainability, and impact. The TE then assessed the key financial aspects of the project, including the extent of co-financing planned and realized. It assessed the extent to which the project was successfully mainstreamed with other UNDP priorities, including improved governance, and gender. The Evaluators also looked at the extent to which the project is achieving impacts or progressing towards the achievement of (intended or unintended) impacts.

1.2 Scope and methodology

Evaluation criteria

The terminal evaluation is based on the OECD-DAC[1] criteria of *relevance, effectiveness, efficiency, sustainability, and impact*. The rating has taken place according to the evaluation criteria using the rating scales recommended in the UNDP *Guidance for Conducting Terminal Evaluation of UNDP-supported, GEF-financed Projects* (2012)[2] and given in Box 2. Evaluation conclusions related to the project's achievements and shortfalls (comprehensive and balanced statements which highlight the strengths, weaknesses, and results of the project, based on the OECD-DAC criteria of relevance, effectiveness, efficiency, sustainability, and impact:

- Relevance: How does the project relate to the main objectives of the GEF focal area, and the environment and development priorities at the local, regional and national levels?
- Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?
- Efficiency: Was the project implemented efficiently and cost-effectively, in line with international and national norms and standards?
- Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?
- Impacts: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental or other impacts?

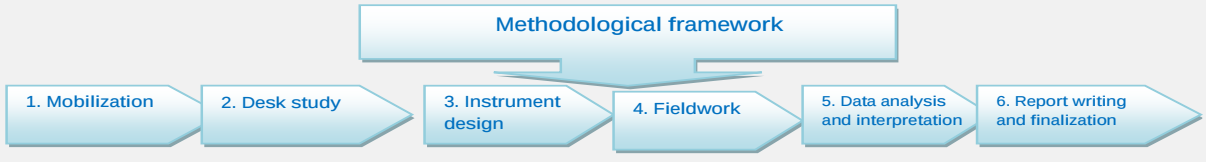
The ratings in this report have been determined based on the project progress reporting and the analysis the Evaluators carried out of the available information and comparing these with observations from the mission (interviews with stakeholders and site visits) and checking with the information presented in project technical reports and policy and background documents. To gather empirical data and information relevant to the project, the evaluators carefully designed several instruments. They included a checklist and evaluative questions for use in collecting primary information. All tools were designed to address the key questions (grouped according to the before-mentioned OECD-DAC criteria) that were part of the Inception Report of the evaluation assignment. Annex D contains the matrix of evaluative questions.

Approach

The TE has been based on the following *sources of information*:

- Desk review of progress reports and project documents (listed in Annex C),
  - CEO Endorsement Request (CEO ER) and annexes; annual progress reports (PIRs, project implementation reviews); other progress reporting and PowerPoints;
  - Overview of budget expenditures and realized co-financing; annual work plans
  - Project technical reports and description of outputs;
  - Project or counterparts' websites; PowerPoints

Box 1 Evaluation method and approach



[1] Organisation for Economic Cooperation and Development (OECD) – Development Assistance Committee (DAC)

[2] Other guidelines consulted are those presented in the UNDP *Handbook on Planning, Monitoring and Evaluating for Development Results*, *Updated Guidance on Evaluation* (2012), the UNDP Discussion Paper: *Innovations in Monitoring & Evaluating Results* (2013) and the GEF *Review of Outcomes to Impacts (ROTI) Handbook* (2009). Regarding gender aspects, the evaluation refers to the *Guide to Gender Mainstreaming in UNDP Supported GEF Financed Projects* (2016).

- National policy documents on (renewable and rural energy) as well as other relevant reports, PowerPoint presentations, and documents from counterpart organizations.

- An evaluation mission of 10 working days (from 27 January to 5 February 2020) to meet UNDP, MUCD, and the Project Team and to hold interviews with project partners and stakeholders in (see the mission itinerary in Annex B). The meetings and interviews helped the reviewers to obtain in-depth information on impressions and experiences and to explore opinions about the Project and their understanding and identify opportunities
- A presentation of the initial findings was made at the end of the evaluation mission (on 05/02/2020).

Regarding *data analysis and methods for analysis*, many relevant reports and documents were collected (where possible before the mission). The review of project and background documents (listed in Annex C) provided the basic facts and information for developing the terminal evaluation report, giving a basic insight into progress (target vs. progress) and reasons for under and over achievements were explored.

The evaluation mission served to verify these basic facts, get missing data and to learn the opinions of stakeholders. The mission consisted of conducting key informant interviews (in Dili) that were made with the representatives of different sectors, such as (i) government entities (Ministry of Public Works); (iii) NGOs, private companies and user groups. To gather information from beneficiaries, stove producers and beneficiaries were visited in Baucau and Ermera area. In addition, the Evaluators interacted closely with the UNDP Country Office and project management (based at UNDP office) in Dili to validate the information collected from the different sources.

Triangulation (interviews, and document analysis) have allowed validation of information through cross verification from two or more sources. In appraising the result-wise effectiveness of the program's major interventions, evaluators thoroughly assessed targets against progress. To supplement this information, the evaluators used information provided by the Project Team[3] and later cross-checked with the documents and

Box 2 Rating and rating scales for evaluation criteria in UNDP/GEF projects

1. Monitoring and Evaluation	*rating*	2. IA& EA Execution	*rating*
M&E design at entry		Quality of UNDP Implementation	
M&E Plan Implementation		Quality of Execution - Executing Agency	
Overall quality of M&E		*Overall quality of Implementation/ Execution:*	
3. Assessment of Outcomes	**rating**	**4. Sustainability**	**rating**
Relevance		Financial resources:	
Effectiveness		Socio-economic:	
Efficiency		Institutional framework and governance:	
Overall Project Outcome Rating		Socio-environmental:	
		Overall likelihood of sustainability:	

Ratings for Outcomes, Effectiveness, Efficiency, M&E, IA&EA Execution

6: Highly Satisfactory (HS): no shortcomings
5: Satisfactory (S): minor shortcomings
4: Moderately Satisfactory (MS)
3. Moderately Unsatisfactory (MU): significant shortcomings
2. Unsatisfactory (U): major problems
1. Highly Unsatisfactory (HU): severe problems

Additional ratings where relevant:
Not Applicable (N/A)
Unable to Assess (U/A)

Sustainability ratings:

4. Likely (L): negligible risks to sustainability
3. Moderately Likely (ML): moderate risks
2. Moderately Unlikely (MU): significant risks
1. Unlikely (U): severe risks

Relevance ratings
2. Relevant (R)
1. Not Relevant (NR)

Impact Ratings:
3. Significant (S)
2. Minimal (M)
1. Negligible (N)

PowerPoints, PIR, quarterly progress reports, minutes of meeting.

interview statements. These processes and methods helped evaluators to gather plenty of evidence about the outcomes of the project. Along with collecting information, evaluators reviewed data from the Project Implementation Reviews (PIRs) and other project-related documents. The evaluators then synthesized and analyzed the collected in order to arrive at their preliminary findings, conclusions, and recommendations. A draft report was shared with project management and UNDP in the agreed format and the report was finalized after incorporating feedback and suggestions.

1.3 Structure of the TE report

This report consists of the report body, executive summary, and annexes. The body of this report is structured around the following chapters: it starts with an introduction to the objectives, scope, and methodology of the terminal evaluation (Chapter One), description of the project context and a summary of project facts (such as start date, duration, the context in which the project started), its objectives and stakeholders (Chapter Two).

The assessment and formulation of the "findings" have been guided by the questions of the "evaluative matrix", of which a final draft was formulated at the inception stage of the assignment (see Annex D)[4]. The report follows the outline for terminal evaluations of UNDP/GEF projects[5] but has split the suggested chapter on "Findings" in three parts for practical reasons due to the chapter size and to permit a more reader-friendly presentation of the information. Findings on relevance, design, and formulation are in Chapter Three. Findings on project implementation and monitoring are presented in Chapter Four. An overview of progress regarding the achievement of outcomes and outputs is given in Chapter Five, which ends with a presentation of findings regarding replication effects and sustainability. Chapter Six presents the conclusions, recommendations, and lessons learned from the project. These include actions that might be taken (by the Government) to help ensure the sustainability and continuity of project achievements, as well as steps that can be taken by UNDP (and GEF) to help improve the design and implementation of future projects.

In development projects, 'results' are the describable or measurable development change resulting from a cause-and-effect relationship. These results include project outputs, short- to medium-term outcomes, and longer-term impacts, (including global environmental and development benefits).

The achievement of the results and the longer-term sustainability thereof is influenced by the:

- way project was formulated and designed (discussed in Chapter 3);
- way the project was implemented by the various project partners (discussed in Chapter 4);
- occurrence and impact of internal and external risks (discussed in Chapter 5).

Annexes at the end of the report include the Terms of Reference (Annex A), field visit details and list of organizations and people interviewed (Annex B), documents collected and bibliography (Annex C), evaluative questions and methodology (Annex D).

[4] See the *Inception Report* of the Terminal Evaluation (January 2020)

[5] See Annex F, 'Evaluation Report Outline' in the UNDP *Guidance for Conducting Terminal Evaluations* (2012)

2. PROJECT DESCRIPTION AND BACKGROUND

2.1 Context and problems that the project sought to address

The main source of primary energy consumed in Timor-Leste is fuelwood. The country consumed around 724 thousand tons (or 232 kilotons of oil equivalent) of fuelwood, which accounted for 59% of the total energy consumption. Firewood is the primary energy source for cooking[6]. According to a study carried out by Mercy Corps in 2011 households use 9.3 kg of firewood per day on average. Multiplying this number with the number of households that report they use firewood for cooking (165,000 households in 2010), it can be estimated that as much as 560,000 tons of firewood were consumed for household cooking in 2010. Other important functions of fires are for heating the household (44% of households), heating water for washing (23%) and drying corn (20%)[7].

Most households use traditional open fires as the main cooking method. Even in Dili district, this is the case for 91-94% of households with 6% using firewood stoves (i.e. about 83% of firewood users) and the remainder using kerosene, LPG or electric stoves. In over 50% of households, cooking is done exclusively by women or mainly by women, while in 47% of households, women and men were reported as both being equally responsible for cooking. In most households (60%) children also participate in cooking, though this is largely the responsibility of girls (47% of households). The collection of (free) firewood by the household is by far the most important means of sourcing, with only 8% of households not engaging in firewood collection. Within the household, the survey suggests that responsibility for firewood collection is shared relatively equally between members (62% of households said that firewood collection is undertaken equally by all household members). In Dili district, however, women and children are primarily responsible[8]. The reports further mention that cooking at institutions (e.g., schools, prisons, and hospitals) still rely on inefficient traditional stoves. In the cottage industrial sector, biomass is being used mainly as fuel to raise steam and heat in the production of tofu/tempeh, salt making, bakery, and coffee roasting.

The country is rich in diversified natural forests with a forest cover of nearly 58% of the total land area (14,900 km^2) of the country. According to reports by FAO and Japan Aid[9], Timor-Leste was losing 1.2-1.7% of forests annually during 1990-2010 due to land clearing, logging, and other causes. There is still abundant biomass supply in most parts of the country, maybe except in Dili area. Because of this abundance, fuelwood is, and for some time to come will continue to be, the cheapest cooking fuel compared to liquefied petroleum gas (LPG), kerosene, and electricity, even after accounting for different cooking equipment efficiencies. The area under plantations has remained stable at 43,000 ha during the period from 2000 to 2010. In the longer term, the combination of small but continuing net deforestation (due to population growth, conversion of forest land for agriculture and insufficient re-planting of trees) may threaten both people's ability to afford fuelwood for cooking and their ability to easily attain it.

Another issue is health. The Mercy Corps (2011) and GACC (2011) report that for 84-89% of households, cooking takes place indoor, mainly in cooking huts, leading to adverse impacts on public health from indoor air pollution (IAP) associated with the use of fuelwood in traditional cookstoves[10]. About 14-16% cooking devices come with hoods and only 0.4% with a chimney. Modern fuels, including LPG and kerosene, have lower emissions and are

6 Census 2010, Timor-Leste

7 Mercy Corps, *Energy for Alll Programme Timor-Leste, Baseline Assessment Report* (2011), a study undertaken in Ainaro, Manufahi and Dili districts

8 Mercy Corps (2011)

9 Japan's Grant Aid for the Forest Preservation Program in the Democratic Republic of Timor-Leste

10 A World Bank report mentions that mortality related to IAP estimated at 187 cases of acute lower respiratory infections (ALRI) and 115 cases of chronic obstructive pulmonary disease (COPD), while annual morbidity are 121 ALRI cases and 403 COPD cases. Source: GACC (2011)

Box 3 Timor-Leste, energy sector

The government's Strategic Development Plan, 2011–2030 targeted 100% electrification by 2015, although not fully electrification in 2019 was reportedly about 80%. The Government currently heavily subsidizes about 85% of the operating cost of about USD 0.42/kWh of the state utility EDTL. Tariffs do not cover costs with residential tariffs of about USD 0.05/kWh (for the first 20 kWh consumed) and USD 0.12/kWh above. Another issue is non-payment of electricity bills (about 60%, as many areas outside Dili have unmetered connections) and high transmission losses (12%).

Timor-Leste on one hand produces and exports fossil fuels (natural gas, 5.78 billion m^3 in 2017) but also imports all its fossil fuel needs (petroleum products, about 3,500 barrels a day in 2016). Natural gas reserves are an estimated 200 billion m^3. Plants run, relatively expensively, on diesel and fuel oil (installed capacity about of about 270 MW in 2015, generating about 385 GWh)[*)]. The Government is looking for alternatives in the form of natural gas, which would reduce operating cost by 50% but require substantial investment to convert existing plants to run on gas. Timor produces substantial amount of natural gas (5.78 billion m^3 in 2017), which is all exported generating important government revenue. Timor-Leste has substantial renewable energy potential, in the form of wind power, solar power and hydropower. While the Government Strategic Plan mentions 2017 targets of 1.25 MW (solar), 42 MW (wind) and 23 MW (hydro), these have not been realized due to lack of investment. The potential of renewables for power generation has been identified as 7 MW (solar), wind (81 MW) and hydro (351 MW).

Sources: Timor-Leste Energy (at https://theodora.com/wfbcurrent/timorleste/timorleste_energy.html)and and ADB Country Partnership Strategy 2016 at http://www.adb.org/countries/timor-leste/strategy; PowerPoint *Acess to Energy in Timor-Leste* (by V. Guterres, General-Director of Electricity at Asian Pacific Energy Forum (Bangkok, 2013)

*) 119 MW plant at Hera (near Dili), 136 MW Betano plant (in Manufahi), 27 MW Comoro plant (Dili) and 17 MW Inur Sakato plant. These will later be converted to run on natural gas

more convenient and cleaner to handle. The alternative of kerosene stoves used to be widely used during the Indonesian time due to low kerosene price and regular supply. After independence, the use of fuelwood increased substantially due to the non-availability of cheap kerosene for household use[11]. The high upfront stove cost, limited access to fuel and safety concerns around LPG hindered the adoption of modern fuels, even in urban areas where firewood is bought at prices similar to LPG or kerosene[12].

In recent years, however, the electrification rate has increased rapidly. At the time of the formulation of the Mercy Corps and GACC studies (2010-2011), electrification was only 42% (with 78% urban areas and 27% in rural areas)[13]. By 2017, electrification had almost doubled to 80%. Similarly, the use of LPG has increased dramatically in Timor-Leste in the past decade, especially in urban areas, as economic conditions improved and a middle class has emerged and expanded; a trend already foreseen in the Mercy Corps and GACC assessments[14]. Consequently, commercial establishments, restaurants, and industries now tend to use modern fuels rather than to rely on firewood.

Traditional stoves in the country have efficiencies of 8 to 37% for the types of stoves. The impact of using efficient woodstoves is potentially substantial. The Mercy Corps (2011) report mentions that an efficiency saving of 40% will result in 1,360 kg less firewood use per year for each stove-using household, reducing deforestation and the pressure on natural resources in target areas[15]. The use of fuel-efficient will also benefit women and girls in particular[16]:

11 Mercy Corps (2011); *Japan's Grant Aid for the Forest Preservation Program in the Democratic Republic of Timor Leste* (2010)

12 Purchased wood (urban areas, USD 143 per gigajoule), kerosene USD 77/GJ and LPG USD 81/GJ. GACC (2011)

13 https://www.indexmundi.com/facts/timor-leste/indicator/EG.ELC.ACCS.ZS; https://theodora.com/wfbcurrent/timorleste/timorleste_energy.htm

14 Global Alliance for Clean Cookstoves (GACC), *Market Assessment and Intervention Options* (2011)

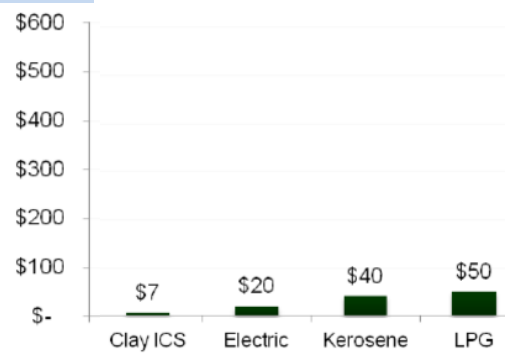
15 The TE Team's estimate is that wood savings can be higher, about 2,545 kg per year per households (see Box 15)

16 Reduction in the large amount of time spent cooking each day and greater ease of cooking; Reduced exposure to smoke, and associated health problems: Reduction in time spent on collecting firewood

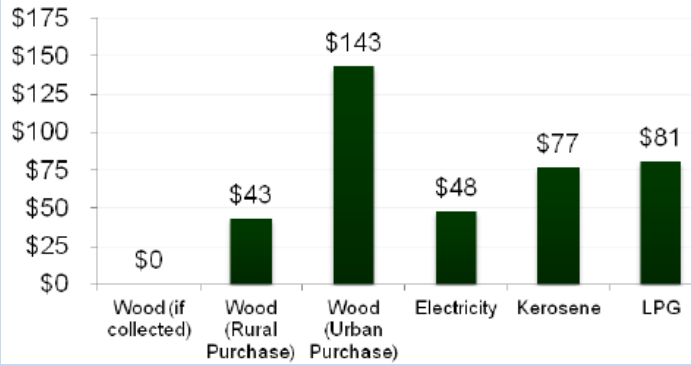
Box 4 Cost comparison of fuels

The GACC (2011) study gives some insight in the cost of fuels and stoves.

Upfront cost of stoves



Fuel cost per gigajoule (GJ)



Improved cookstoves cost more than mentioned in the GACC study, around USD 10-15. LPG has a higher upfront cost than indicated as also the 9 kg bottle need to be purchased upfront. Electricity is cheapest but depending on the tariff paid. The commercial tariff is around USD 0.24/kWh, but households' profit from subsidized rate (USD 0.12/kWh). If purchased wood costs about USD 3-10 for a week's supply. Kerosene costs USD 1 per liter, while the 9 kg LPG bottle is about USD 40 (but will last about 2 months).

Although some initiatives were initiated in the past to introduce improved cookstoves in the country, these did not lead to the widespread dissemination of efficient woodstoves. One reason is the insufficient emphasis on the understanding of the differences between consumers and their respective ability to pay. Consumer cooking habits and preferences vary, based on location (urban or rural) as well as income levels (affluent, middle class, poor) and sector (residential, commercial-industrial), and preferences (e.g. strong cultural attachment to dishes with smoky flavor; smoke repelling; insects, cooking for space heating in cold mornings in mountainous areas.). Awareness efforts in woodstove programs have often focused on one or facet of the benefits of stoves (e.g. health) but should holistically encompass all aspects (e.g. health, financial, ease of work, environmental, etc.). The Mercy Corps study (2011) mentions that there is a general lack of knowledge in communities about fuel-efficient stoves, although once informed, households reportedly do show interest in trying alternative ways of cooking.

The GACC study (2011) further mentions that the cookstove industry is in a very elementary stage with small scale clay cookstove producers in a few rural areas and a few steel electric and LPG stove importers in the larger cities. In donor-supported, NGO-implemented, wood stove projects in the past, the NGO involved typically acted as a middleman, acquiring the stoves from the producers and distributing these to the beneficiaries. Thus, cookstove producers often did not establish direct business contacts with end-users and thus could only obtain a limited understanding of underlying consumer segment needs, while end-users could not provide feedback to producers regarding problems with stove use or for maintenance needs. Past programs often failed following program completion as beneficiaries revert to traditional cooking methods once their pilot stove breaks.

Important to note is that efficient stoves often were handed out almost for free to end-users. This has created a 'culture' of stoves being a 'free' article. Having been given the original stove for 'free', end-users cannot or do not want to have the stove repaired or buy a replacement stove at (full) cost price. One lesson learned has been that improved cookstove (ICS) solutions should seek to establish a commercial approach as early as possible by building private sector capacity to support the ongoing supply and maintenance of cookstoves following the initial pilots, and instilling a culture of payment for stoves rather than expecting that stoves are handed out for 'free'.

According to the Nationally Determined Contributions (2016) document, the country's greenhouse gas emissions were 1,483 tCO_2 in 2010, of which 17% from energy, 65% from agriculture, 14% from LULUCF, and 4% from waste; about 55% is associated with biomass production and utilization in these sectors. The NDC mentions a number of

mitigation options, such as increased penetration of renewables in the energy sector (in electricity production) and energy conservation measures (in industry, transport, and residential sectors), sustainable production and utilization of biomass resources, including the dissemination of energy-efficient woodstoves, promotion of biogas, sustainable forest management, and reforestation. With UNDP support, the country is currently preparing the Second National Communication to the UNFCCC, planned to be finalized in 2020.

2.2 Project description and strategy

2.2.1 Objective, outcomes, and indicators

The Promoting Sustainable Bio-energy Production from Biomass" (SBEPB) Project (hereafter also referred to as the 'Biomass' Project was designed to provide the Government of Timor-Leste with opportunities to overcome barriers related to policy-institutional, market and finance, and knowledge and information (see Box 5) through strengthening the institutional, technical, and financial and organizational capabilities of its agencies in the area of sustainable biomass supply and demand for clean bioenergy, especially at it applies to the residential and institutional sector

In order to address these barriers, mentioned in the previous Section, the four-year Sustainable Bioenergy Production from Biomass (SBEPB) Project, with the support of the Global Environment Facility (GEF), the Government of Timor-Leste (GoTL), the United Nations Development Programme (UNDP) and other funding partners, has focused on the promotion and use of biomass energy resources for the provision of energy access and services in rural areas. The GEF CEO Endorsement Request (CER) mentions GEF financing of USD 1,743,000 contribution, which is supplemented with planned co-financing by the United Nations Development Programme (UNDP) of USD 770,000, government entities (USD 5,510,000) and leveraged co-financing from private sector and non-governmental organizations (USD 370,000). UNDP is the GEF Implementing Agency and Executing Agency (under Direct Implementation Modality, DIM) with as the Implementing Partner the State Secretariat for Electricity (SSE) under the Ministry of Public Works. After SSE got disbanded, its role as Implementing Partner was taken over by the state utility EDTL.

Box 5 Barriers to be addressed in the Project's components

Barrier	Project outcome
Policy Aspects: • Inadequate and incoherent policies • Weak institutional set up • Insufficient capacity to formulate and enforce policy/regulation	Implementation of strengthened enabling policies, legal and institutional framework for deployment of biomass energy technologies as well as the growth of biomass energy businesses in Timor-Leste
Market &Finance: • Lack of access to alternative technology and fuel; • Lack of market-based mechanism and inclusive value chain financing to support value chain actors	Increased investments in bioenergy, leading to the development of a local supply chain and market for BETs that will contribute to GHG emissions avoided from technology applications and investments
Knowledge & Information: • Low degree of local knowledge & expertise/capability/ exposure to produce and utilize modern and efficient biomass systems • Low level of awareness and capacity on sustainable biomass energy technologies	Enhanced capacities of policy makers, financial institutions, entrepreneurs, project developers, communities and end-users on the development of the local BET market

The Biomass Project officially commenced on 10 October 2014 but only started implementation effectively at the establishment of the project management unit early 2016. The project was designed as a 4-year project, terminating on 26 September 2018 but successfully requested an 18-month project extension, thereby extending the project closure to 26 March 2020.

A summary of the project framework with **objective, outcomes, outputs, and indicators** is provided in Box 6.

Box 6 Summary of the project objective, outcomes, and outputs
(as given in the Project Document)

Goal / objective:	**Indicators with target value** *(at end-of-project, EoP; baseline value = 0; unless indicated otherwise)*
Project goal: Reduction of GHG emissions through sustainable production and utilization of biomass energy in the country, and the promotion of innovative low-carbon biomass energy technologies.	1. Quantity of GHG emissions mitigated annually: 117,145 tCO_2 2. Total cumulative quantity of GHG emissions mitigated: 206,633 tCO_2
Project objective: Removal of barriers to sustainable production and utilization of biomass resources in Timor-Leste and application of biomass energy technologies to support local economic, environmental and social development that leads to GHG mitigation	3. Reduction of non-sustainable fuelwood consumption for energy use in households and industries: 192,665 tons 4. No. of households and industries that adopted, and are benefiting from, the energy-efficient furnaces/stoves & other BET applications: 20,000

It is interesting to note that the end-of-project of the project is 20,000 households, represents approximately 10% households of the country (206,483 households with an average household size of 5.7), based on the 2015 Census Data.

Component 1. Policy and institutional support for deployment and commercialization of advanced bioenergy technologies
GEF budget: USD 125,000 (TA). Co-financing: USD 570,000

***Outcome* / output:**	**Indicators with target value** *(at end-of-project, EoP; baseline value = 0, unless indicated otherwise)*
1.1 Implementation of strengthened enabling policies, legal and institutional framework for the deployment of biomass energy technologies as well as the growth of biomass energy businesses in Timor-Leste. 1.1 Developed and adopted new regulations and technical guidelines for renewable energy technology appraisal and evaluations 1.2 Developed and implemented national strategy and roadmap for the promotion of bioenergy production and utilization 1.3 Designed and operational national biomass energy resource inventory 1.4 Modalities and details of the participation of community-based organizations and grassroots institutions finalized and agreed	5. No. of sustainable biomass energy production businesses that were proposed and developed as influenced by the strengthened policy and institutional frameworks for the deployment of BETs and biomass energy businesses by Year 2: 25 6. No. of biomass energy utilization projects that are planned and developed for PURE/SURE purposes: 25 7. No. of policies and legal frameworks that is supportive of BET applications and biomass energy business development approved and enforced by Year 3: one 8. Volume of funding made available for BET application: USD 1 million/yr 9. No. of relevant GOT agencies and institutions involved in biomass energy production and use of BETs and are linked with each other via a working mechanism for coordination: five (05) 10. No. of satisfied users of the Biomass Energy Resource Information System (BERIS) each year (starting Year 2): 200

Component 2: Bioenergy investments promotion - sustainable bioenergy technology demonstration & market development
GEF budget: USD 1,197,000 (INV). Co-financing: USD 4,785,000 (INV)

Outcome and output:	Indicators with target value *(at end-of-project, EoP; baseline value = 0, unless indicated otherwise)*
2.1 Availability of financial support for rural bio-energy production and associated low- carbon technology applications 2.1 Designed and implemented start-up grant and end-user subsidies to enable market development for private-sector participation in biomass energy business	11. No. of operational financial support schemes (e.g., loan products) for scaling up and replicating successfully implemented BET projects (e.g., ICS) by Year 2, including the LRGS: 2 12. No. of local financial institutions that apply the new financial support schemes to support BET projects: 2 13. Volume of funds earmarked by participating FIs for financing BET projects: USD 3 million/year
2.2 Increased investments in Bio-energy *2.3 GHG emissions avoided from technology applications and investments* 2.2 Implemented and operational 400 locally produced industrial stoves for income-generating local enterprises such as tofu/tempeh and salt production, bakery and coffee roasting 2.3 Implemented and operational locally produced 19,600 energy-efficient cookstoves in households and local enterprise / community-based institutions	14. Production of improved cookstoves (ICS): 20,000 units 15. No. of ICS bought and utilized by consumers annually starting Year 4: 20,000 units 16. No. of furnaces/stoves installed & being used on a daily basis by households in targeted areas: 600 17. No. of industrial stoves installed and are operational: 400 18. Total volume of investments on biomass energy technology applications: USD 1 million/year 19. Annual quantities of sustainable fuelwood produced, starting Year 4: 1 ton 20. Annual fuelwood savings from the cost-effective and efficient use of biomass energy in rural communities starting Year 4: 109,226 ton 21. Annual GHG emission reduction from the cost-effective and efficient use of biomass energy in rural communities: 117,145 tons

Component 3. Capacity development and market transformation

GEF budget: USD 303,000 (TA). Co-financing: USD 680,000

Outcome and output:	Indicators:
3.1 Enhanced capacities of policymakers, financial institutions, entrepreneurs, project developers, communities and end-users on the development of the local BET market 3.1 Established and operational Research, Knowledge, Learning and Coordination Centre, leading a network, for Timor-Leste 3.2 Energy, Industrial and Rural Development planners trained on integrated rural energy planning, low carbon technology promotion and regulatory enforcement 3.3 Public stakeholders, project developers and micro-entrepreneurs trained on bio-energy technology component manufacturing/fabricating; BET project development, consultancy and energy services provision 3.4 Communities and local institutions trained on the installation and maintenance of energy-efficient cookstoves/ furnaces 3.5 Completed site visits to successfully operated BET applications and dialogues with policymakers, regulators, technology developers, entrepreneurs and financiers	22. No. of local manufacturing firms that can fabricate and install equipment/ components used in BET systems: 25 (baseline: one) 23. No. of trained and qualified men and women technicians working on BET application projects: 25 24. No. of trained men and women technicians who are qualified to repair and maintain BET equipment and installations: 25 25. No. of trained and qualified men and women in rural communities gainfully engaged in community forestry and woodlot operations: 25 26. No. of local development plans that integrate biomass energy use, BET applications, and biomass industry development prepared by local government men and women planners: 10 27. No. of local men and women financial officers that are capable of evaluating biomass energy and other RE project proposals: 15 28. No. of local entrepreneurs and SMEs that are gainfully involved in businesses that make up the value chain of the BET application industry: 25

The GEF budget for project management cost is USD 51,700 (matched by USD 229,533 of co-financing).

Sources of Co-financing	Name of Co-financier (source)	Co-financing (in USD)		
		In-kind	Grant	Total
Nat'l Government	MCUD - Ministry of Construction and Urban Development	1,310,000	4,200,000	5,510,000
NGOs	Mercy Corps		210,000	210,000
NGOs	Haburas	60,000		60,000
Private Sector	Startec		100,000	100,000
GEF Agency	UNDP (core resources)		350,000	350,000
	UNDP (Social Business Project)	420,000		420,000
Total Co-financing				6,900,000

Note: The Social Business project was implemented by UNDP during 2012-2016 in partnership with the Ministry of Commerce, Industry and Environment and it is funded by the Korean Government. The Project included consultancy work to assess the development of a Social Business Fund, assessing the existing funding/lending mechanisms for medium scale businesses and the need for establishing an independent/ special funding mechanism for Social Business financing.

2.3 Project partners and stakeholders

2.3.1 Main project partners and project implementation arrangement

UNDP, the GEF Implementing Agency, has implemented the project under the Direct Implementation Modality (DIM). Originally, the State Secretariat for Electricity (under the Ministry of Public Works) was intended to act as a lead partner from the Government of Timor-Leste but after dismantling of the SSE, it was decided to work with the Electricidade de Timor Leste (EDTL) under the Ministry of Public Works to be considered as the most appropriate entity for driving the Project forward.

The Biomass Project is managed by a PMU that is led by a Project Manager (CTA)[17] who manages a team of consultants. The Project Steering Committee (PSC) mandate is to provide overall guidance for the Biomass Project throughout its implementation and be responsible for, amongst other responsibilities, coordination amongst various government agencies, overseeing work carried out by different agencies, monitoring progress and approving plans and reports, and providing oversight to financial management and production of financial reports. The PSC includes representatives from the Ministry of Public Works (MPW), Ministry of Finance (MoF), Ministry of Commerce, Industry and Environment (MCIE), Ministry of Agriculture and Fisheries (MAF) and UNDP. The PSC is chaired by the EDTL National Director for Renewable Energy[18]. UNDP also has had a role in project assurance. This role has been exercised by the UNDP Program Officer responsible for the project, based in the UNDP Country Office (CO) and the Regional Technical Advisor (RTA) based in the UNDP Bangkok Regional Hub[19].

2.3.2 Stakeholders

Box 7 List of project stakeholders

Entity	Description
Ministry of Public Works (MoPW) - Electricidade de Timor-Leste (EDTL)	MoPW is the Project's implementing partner. The original project partner was the State Secretariat for Energy Policy, established in 2012 under MoPW (TC)[20], but was de-established later, after which EDTL became Project Partner. EDTL is the vertically integrated monopoly generator and distributor of electric power in Timor Leste.

[17] Mr. Alamgir Hussain until 2019. Thereafter, project management responsible has been Mr. Ilidio Ximenes

[18] Mr. Virgilio Guterres

[19] Ms. Felisberta Moniz da Silva and Ms. Milou Beerepoot, respectively

[20] Public Works, Transport and Communications have been in one ministry from, 2002-2007 and from 2012-2018 and in separate ministries (a. Public Works, b. Transport and Communications) during 2007-2012 and since 2018

National Directorate of Forestry (NDF)	Under the Ministry of Agriculture and Fisheries, NDF has sustainable forest management and afforestation/reforestation programmes.
National Centre for Employment and Professional Training (CNEFP)	CNEFP *(Centro Nacional de Emprego e Formação Profissional)*, an institute under the Ministy of Higher Education, develops training in the areas of construction, carpentry, electricity, plumbing and masonry. At its premises, CNEFP has installed a biogas installation with Project support.
Dili Institute of Technology (DIT)	DIT is a private, non-profit and accredited higher education, which runs the Timor-Leste Regional Cookstove Testing Centre (with support from Mercy Corps) working with biomass (agricultural residue, processed biomass, etc.), kerosene, and pellets / briquettes,
Universidade Nacional Timor Lorosa (UNTL)	UNTL is the major institution of higher education in the country. The Department of Community Development leads local researchers and supervises the data collection and analysis on community development in the country
Mercy Corps	Mercy Corps is an international, non-governmental humanitarian relief and development agency with headquarters in the UK and the USA. Mercy Corps has been operating in Timor-Leste since 2005, implementing programmes with funding from USAID, the EU, DFID, OFDA and the UN. During 2011-2014, Mercy Corps implemented an EU financed alternative energy program E4A with a focus on clean cook stove and solar technologies (budget: EUR 1.07 million), resulting in the support of 13 stove manufacturers and distribution of about 3,275 stoves[21]. Mercy Corps has supported setting up a Cook Stove Testing and Development Centre (CTDC) at Dili Institute of Technology (DIT). With E4A support, the studies "Baseline Assessment" (2011) on energy use and energy poverty was carried out
Global Alliance for Clean Cookstoves (GACC)	GACC carried out a market assessment in 2011, consisting of the cookstove sector mapping and a list of intervention options.
World Food Programme (WFP)	WFP has been working in Timor-Leste since 1999 and its activities focus on improving the nutritional status of children under five and women, increasing school enrolment, attendance and retention, and improving food security for the poorest. The organization has installed clay and biogas stoves and kitchen improvement in over schools
UNICEF	UNICEF implemented an ICS project in Aileu district. The main emphasis of UNICEF's ICS project is to address the improvement of health conditions of children (and women)
Haburas Foundation	Haburas is a not-profit-making organization, founded in 1999. Its programmes include environmental education, environmental advocacy and environmental management. The NGO has also pioneered the bio-briquette project to train unemployment youth to make briquette from waste papers, rice and coffee husk, and sawdust.
Producers and distributors	These include a) (local)-NGO type of organizations, such as: • Naroman Timor Foundation (national NGO that was established in 2002, focusing on energy, sanitation, clean water, health promotion, and agriculture) • Nazareth Foundation (national NGO supporting small business initiatives and with a focus on training and employing people with a disability, orphans, and widows. It produces the rocket cookstove) • Centru Sover (social enterprise working on green solutions, such as plastic recycling, sustainable brick making, stove production) • Blacksmith (small enterprise based in Baucau that produces agricultural and construction equipment as well as wood stoves) • Mesak Training Centre runs by university alumni, produces bio-briquettes, cook stoves and engineering design training to youth and students • Ermera Gleno (Humboe Association) produces cookstoves and distributes in Ermera district. Most of the the stoves are freely distributed • Startech is a local distributor of kits and importing cookstoves and materials from China
Microfinance	Kaebauk (KIF), Moris Rasik and Tuba Rai Metin are three MFI institutions that operate in Timor-Leste.

[21] webgate.ec.europa.eu/multisite/devco/case-studies/energy-all-e4a-alternative-energy-solutions-rural-and-peri-urban-timor-leste_en

3. FINDINGS: PROJECT DESIGN AND STRATEGY

Next in this report follows an overview of the evaluation findings. Due to the size of the main text it has been divided over three chapters that cover a) project design & formulation, b) project implementation, and c) project results and sustainability. The findings are based on several evaluative criteria and questions (originally formulated in the Inception report and slightly re-formulated). The questions in the orange-colored boxes in this and other Chapters are taken from the Evaluative matrix (Annex D) as these correspond to the appropriate Section in this report. Here, the reader can make a link between the evaluative matrix and how the main text addresses these questions.

Chapter 3 looks first at the project relevance and country drivenness (at project design), and links with national and development. Second, it looks at the design logic (in the framework of outcomes and objectives to reach the objective) and how the design framework was formulated, including the indicators and target values for outcomes and outputs.

3.1 Relevance and design

Country priorities and relevance

- Is the Project relevant to UNDP objectives?
- Is the Project relevant to Timor-Leste's environmental objectives?
- Does the Project address the needs of target beneficiaries?

Relevance

Government policies and legislation

The project is fully in line with the national policies and measures that aim at forest conservation, sustainable energy, and climate change

- The *Environmental Basic Law* (Decree Law 26/2012) covers climate change adaptation and mitigation issues;
- Decree Law 5/2011 on *Environmental Licensing* and the need to prevent negative impacts on the environment and the commitment of the Government to voluntarily reduce carbon emissions;
- *National Determined Contribution (NDC)*, published in 2016, mentions several mitigation options that specifically mention energy-efficient cookstoves (see Box 8) and refers explicitly to the UNDP/GEF "Promoting Sustainable Bio-energy production from biomass" with the target of reaching 20,000 households with ICS, as well as industrial and institutional stoves;
- The 2012 *Master Plan of Renewable Energy for Electricity* Development in Timor-Leste undertaken by the Secretary of State for Energy Policy which identified over 450 MW of potential renewable energy resources
- Proposed *Renewable Energy Law* of which the draft has been formulated with support from the Biomass Project and presented to the Government (currently under discussion; see Box 16).

GEF and UNDP programming

The project results framework in the ProDoc refers to the following Outcome (# 1.3) as defined in the Country Programme: "Improved sustainability of natural resources management and resilience of ecosystems and vulnerable populations to the changing climate" with the corresponding Outcome Indicator "Change in energy intensity of economy and greenhouse gas emissions per capita.".

Box 8 Selected mitigation options mentioned in the NDC (2016) document

Sector	Mitigation option
Renewable and low-carbon energy	Achieve higher efficiency and less carbon emissions from power generation using (pico-micro)-hydro, biomass, biogas, solar PV, wind at different scales and through natural gas power generation. Reduce dependency on imported fuel
Rural electrification	Enhancing rural electrification using renewable energy to supply energy in rural communities
Energy-efficient cookstoves	Reduce dependency on fossil fuels for cooking. Reduce the average amount of fuelwood used for cooking in private households (and thereby deforestation) by introducing fuel substitution and supporting the use of energy-efficient stoves
Energy efficiency	To promote the use of higher-efficiency technologies in end uses (efficient lamps, efficient electric motors, building codes and efficient energy systems)
Agriculture	Promoting biogas and composting
Rehabilitation of degraded lands; customary forestry	Sustainable forest management. Promotion of customary forestry practices and better management of forest resources through natural regeneration
Afforestation and reforestation	Plant one million trees a year according to the National Strategic Plan

Compiled Nationally Determined Contributions (2016), Ministry of Commerce, Industry and Environment

The project falls within the GEF-5 program area "GEF Climate Change Mitigation; Strategic Programme SP-2 "Promote Market Transformation in Industry and the Buildings Sector" with the Outcomes:

1.1 Appropriate policy, legal and regulatory frameworks adopted and enforced (Indicator: Extent to which EE policies and regulations are adopted and enforced;
1.2 Sustainable financing and delivery mechanisms established and operational (Indicator: Volume of investment mobilized)
1.3 Greenhouse gas emission avoided (Indicator: tons of $CO_{2\text{-}eq}$)

Sustainable Development Goals (SDGs)

The project document (ProDoc) does not explicitly refer to the SDGs, maybe because it was not a requirement to do so at the time of ProDoc formulation. The Evaluation Team can confirm that the SBEPB Project addresses several SDGs both directly as well as indirectly, as indicated Box 9.

Beneficiaries and gender

Stove-using households will be important beneficiaries of the SBEBP. They will benefit more convenience in food preparation and less exposure to pollutants and reduced firewood collection time. On the other hand, the experiences of end-users also form important feedback on the features, quality and convenience from the end-user's perspective to the producers. This will help them to improve the design and adapt to the end-user's wishes. Producers and retailers are a second group of beneficiaries that benefit from the Project's financial support and capacity strengthening activities (business skills, technical skills, marketing). A third group is formed by *suco* (village) and *aldeia* (hamelet) officials that have been sensitized, while on the other have provided community-level support to the Project in conducting awareness & training activities. The reader is also referred to Box 27 on factors that influence the sustainability of results and impacts of stoves programs.

Gender as such is not reflected in the results framework, because at the time of project conceptualization (2015) there were no clear guidelines on including gender-relevant indicators in the results framework. Only the most recent UNDP/GEF ProDoc template now includes a separate section dedicated to gender issues, while a gender action plan needs to be annexed).

This does not mean that the Project has ignored gender issues during implementation, in fact, women (and girls) are the main beneficiaries of using improved cookstoves (ICS). Promotion of ICS is supporting rural and urban

women of Timor-Leste to be able to save time from cooking and fuelwood collection related activities[22], helping to reduce indoor air pollution and associated health issue. For beneficiary selection, the project focused more on women-led households and also gave special consideration for stove producers that employ disabled, widows and other groups that otherwise have little income-generation capacity.

- How is the Project complementary to activities of other stakeholders and donors active in the region or the country?
- How did the Project address the priorities and development challenges of targeted beneficiaries?
- What changes could have been made (if any) to the design of the Project in order to improve the achievement of the Project's expected results?
- Is the Project internally coherent in its design?

3.2 Conceptualization and results framework

Previous ICS projects, studies, and experiences

A number of assessments have been carried out on rural energy use and supply (including fuelwood), such as the Mercy Corps study *Baseline Assessment Report* (2011) which incorporates the results of an energy survey undertaken for 570 households in 2010[23]), and a cookstove market assessment undertaken by the Global Alliance for Clean Cookstoves (GACC). Some findings that came out of these studies included:

- Indoor Air Pollution (IAP) is caused mainly from using firewood with rudimentary cooking devices and from living in a smoky environment for perceived health and functional benefits
- While there is some awareness of IAP among the Government and NGOs, there is very low awareness in the general population on health effects
- Consumer cooking habits and preferences vary based on urban and rural living as well as income levels; strong cultural attachment to smoke, abundant supply of firewood and high clean fuel costs create high barriers to switching from firewood
- The cookstove industry is in a very elementary stage with small-scale (not-for-profit) clay cookstove producers in a few rural areas and a few steel electric and LPG stove importers in the larger cities

Box 9 Sustainable Development Goals with relevance to the SBEPB Project

Sustainable Development Goals	Linkage with energy efficiency
Sustainable energy	
7.2 Increase substantially the share of renewable energy in the global energy mix 7.3 Double the global rate of improvement in energy efficiency	7a. Enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies 7b. Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries
Other SDGs:	
13. Take urgent action to combat climate change and its impacts	The carbon-intensive energy sector (based on fossil fuels) is a key driver of climate change.
17. Partnerships for the goals	Partnerships between governments, the private sector and civil society to achieve green and low-carbon buildings

Compiled from *Transforming our World: the 2030 Agenda for Sustainable Development* (UN, 2015), *Indicators and a Monitoring Framework for the Sustainable Development* Goals, Sustainable Development Solutions Network (SDSN)

[22] According to the Mercy Corps (2011) survey in the three districts (municipalities) of Dili, Manufahi and Ainaro, cooking is the (main or only) responsibility of women in 50% of the cases and shared between men and women in 47% of the cases. Children assist in cooking in 60% of the cases. Women and children are responsible in 21% of the cases interviewed for firewood collection, while in 62% of cases women and men share the task.

[23] In Dili, Manufahi and Ainaro Districts that (at that time) had 8,526 households

Several cookstove projects were initiated around 2009-2011 by NGOs (such as Mercy Corps) and UN agencies (such as UNICEF, WNF[24], UNICEF, and the national NGOs Haburas and Permatil[25]). However, efficient cookstoves (and rural energy) programs have not gone beyond a pilot phase and, facing capacity and cultural challenges did not become scalable and sustainable.

Cultural challenges remain important. Households cook mostly indoor in cooking huts on open fires, which is a habit difficult to change. While households are familiar with cooking a variety of meals on an open fire, they have little or no experience with efficient stoves. When it turns that stoves are too small for the amount they cook, or some meals cannot be cooked fast enough, or they miss the 'smokey' taste, they often revert to cooking on the traditional open fire. On the other hand, the Mercy Corps survey also mentioned that using the stoves in many cases also implied easier use of cooking.

Box 10 Some findings of the TE Team regarding beneficiaries' opinion (stove users and producers)

As part of the TE mission agenda, several meetings were held with producers (e.g. Nazareth, Naroman, Mesak, Blacksmith, Ermera-Humboie) at which also stove users were present. The TE Team can neither claim that the number of end-users present at these meetings is representative for Timor as a whole or certain market segments nor was it within the Team's mandate to set up a statistically relevant end-user survey. For example, people invited at these meetings were actual users, but thus we miss the households that did not acquire a stove or the households that did but abandoned the stoves. Nonetheless, the discussions gave some findings the Team would like to highlight.

In general, respondents mentioned the benefits of using efficient stoves instead of the traditional open fire. Modern alternatives are considered too expensive for cooking (in the case of electricity) or difficult to access (lack of LPG distribution points in rural areas). Users interviewed were in general aware of the health benefits from using less fuelwood in an indoor environment. Many also mentioned the reduced time for fuelwood collection as a benefit. On the other hand, it was mentioned that not all meals can be easily cooked, especially those that need to be cooked fast. A school that the Team visited had acquired a larger 'institutional stove' that was not in use the reason being stated that its size was not enough to satisfy the cooking needs of so many pupils. But with pupils having to gather the fuelwood (for free) rather than having to purchase fuel, the schools' management may not appreciate the value of the stove. The issue of how many stoves (of the 20,000 distributed with Project support) are still in use after some time (in institutions and households) is an important one that needs to be studied in a follow-up survey; see Recommendations).

That people see the health and convenience benefits is encouraging. A crucial question is 'are they able or willing to pay'. People may not earn more than USD 100 a month, so asking a price of USD 10-15 may be too much (unless they could pay over time; see the example of Lesotho in Box 23). Here an important gender aspect may play a role. While men do participate in fuelwood collection, cooking and firewood fetching is still the main responsibility of women. Can it be that men are reluctant to spend money on stoves because they have 'free' labor at home in the form of women and children?

The producers interviewed were, in general, negative about the prospect of customers paying for stoves The Team observes that, so far, their business has been handing out stoves with 80-100% subsidy while in the past their contact was not directly with users. So, they may not have studied the market well and have little experience in selling stoves at a certain price. People have become accustomed to receiving out stoves for free, so they will always say in surveys 'we cannot afford' hoping to qualify for receiving a stove. However, once they realize that the days of receiving free stoves are over, some households may be willing to pay a certain amount for a woodstove. To test the willingness/ability to pay, in the last phase of SBEPB, UNDP has an activity of disseminating stoves with a 50% subsidy. On the way back from Ermera to Dili, the Team could see fuelwood being sold at the street side. So, there must be a market segment that purchases wood and this segment may be interested in reducing their cost by using an efficient wood stove. Another observation in the Ermera was the seasonality of income associated with coffee cultivation. So, a good time to market stoves is when people have cash after the coffee harvest.

[24] WFP disseminated clay-brick stoves to about 1,000 schools. UNICEF distributed clay stoves to schools and rural families

[25] Haburas has disseminated efficient wood and briquette stoves (in Dili and rural areas), while Permatil promoted self-made stoves in Baucau and Turascai in 2011. Source: GACC (2011)

While health benefits have the potential to be a major factor in persuading women to shift cooking practices to using energy-efficient stoves, these need to be accompanied by ongoing campaigns on indoor smoke pollution. The Mercy Corps study mentions that "perceptions of problems with the use of open fires are widespread, and in many communities, women expressed interest in trying alternative ways of cooking". Problems mentioned were breathing and eye problems and fevers,

There is still abundant biomass supply in most parts of the country, and, mostly being gathered it is in most cases 'free'. Consequently, firewood collection is not necessarily seen as a burden for households, in particular women and girls (an argument that is often put forward by NGOs). Indeed, respondents in the Mercy Corps survey acknowledge the time-saving aspect of using an efficient stove in terms of less time needed to collect wood. On the other hand, the same Mercy Corps study mentions that respondents in the survey often mentioned that collecting firewood was not a big problem: "many women said that going into the woods to collect firewood makes them happy as they usually go with neighbors and with children and it is often a fun time to socialize and escape the confines of their home where they always have chores to do". Only a very low number of households (in peri-urban areas) purchase firewood[26]. Balancing the pros (health, time-savings, ease of cooking) and cons (not all meals can be cooked on a particular stove) of using an efficient stove, the monetary aspect may be the crucial aspect in deciding on purchasing a woodstove. With most wood collected, households see the health and time-saving advantages but do not see the monetary benefits. With efficient stoves costing between USD 10-15, it has proven difficult to persuade households to spend this amount on the purchasing of a stove.

It is surprising that these donor-driven stove assessments and projects, seem to dodge the issue of ability and willingness to pay. Or maybe they do not. Realizing the issue, most programs in the past did resort to almost giving away the stove for (almost) free. However, this has been detrimental for the sustainability of stove projects; as soon as the donor funding dries up, stove producers stop producing as they realize the market for purchasing stoves at cost price is very low. In stove projects in the past, the NGO often acted as a middleman, acquiring stoves from producers, to be delivered to villagers and communities. This has not enabled producers to set up marketing channels directly with potential customers and try to sell stoves closer to cost price. In reality, they just wait for the next donor project to come.

The Project Document acknowledges some of these issues and mentions (on page 27) that it "aims at integrating market-based management approaches to scale up bioenergy as inclusive business development" and working with micro-finance organizations to address the initial cost price issue. The Document further mentions that "Subsidies on the cost of the stoves will be provided to the end-users. The subsidy will initially be 70% of the cost of the stoves and will be reduced to 40% towards the end of the Project" (page 35). However, the Project Document present this concept without much evidence that or what end-users would be willing (or able) to pay for an improved cookstove (ICS).

Project design and logic

The Project Document is overly optimistic in achieving goals, given the above-described situation at project design of low level of penetration of efficient stoves, lack of information on the willingness or ability to pay, limited government funding availability and lack of technical and marketing capacity, and the limited budget of the Biomass Project (which is only medium-sized, MSP). The Project Document seems to aim at solving all the issues and lift the stove market from demonstration to pre-commercial phase (see Box 22) in a very short period of three to four years. Where similar stove initiatives have failed to make a long-term and sustainable impact, it is not clear why SBEPB would be different. As discussed in Section 5.4, the project design critically under-estimates certain risks and this may have led to ambitious goal formulation.

[26] The Mercy Corps study gives a figure of 13% of households, mostly in Dili area

The Project Document comes with a results framework with indicators that indicate the progress towards achieving outcomes that reflect the deliverables (outcomes/outputs). As the deliverables have been over-ambitiously formulated, not surprising are the indicator's end-of-project indicators often not realistic. Worse, the results framework has a whopping list of 28 indicators that have many inconsistencies and often overlap or duplicate. To give some examples, the objective indicator "No. of households and industries that adopted, and are benefiting from, the energy-efficient furnaces/stoves" with end-of-project (EoP) of 20,000, appears in various incarnations as indicators of Outcome 2 "Production of improved cookstoves (ICS) by Year 4", with EoP target of 20,000 and as "No. of ICS bought and utilized by consumers annually starting Year 4, also 20,000.

The Project appears to cover too many topics. This is already implicit in the Project's title "Promoting Sustainable Biomass Production from Biomass in Timor-Leste". This suggests that sustainable biomass (wood) production is a major area of focus, while in reality, the Project has focused on the use of biomass (stoves, biogas) with 'production' limited to biomass resource inventory activities[27]. One log frame indicator refers to 'PURE/SURE' projects (meaning 'productive use of energy' and 'social uses of energy') without any specific Project activities dealing with the subject. The Project Document itself lists five outcomes (see Box 6), which may be too much for a medium-sized project (although one of the outcomes mentioned, 'GHG emissions avoided from technology applications and investments' is not an outcome per se but a duplication of the 'project goal' of 'Reduction of GHG emissions through sustainable production and utilization of biomass energy'.

Another challenge from the Project Document arises from the ambition to get substantial financial instruments (such as a loan guarantee scheme) delivered with the Project (Output 2.1) while there seems to have been no consultation with the financial institutions targeted for these financial instruments. No letters of interest were submitted with the Project Document and discussions with financial institutions only started after the inception of the project. Also, the size of the financial instruments, e.g. the indicator 'volume of funds earmarked by financial institutions' of USD 3 million for BET technologies by the end of the project, is unrealistic given the size and production capacity of the stove producers (very small NGOs or social enterprises) and given the size of the Timorese economy[28]. While indeed, financing for companies and micro-credit can play a potentially important role, the financial instrument described in the Project Document appears to be defined without assessing what would be the need of such an instrument in a barely nascent stove market (still in research and demonstration phase in Timor-Leste).

Risk assessment

The Project Document contains an assessment of risks that could hinder project implementation. While the list of risks appears to complete, the level of risk indication (high, medium, low) sometimes misses the mark completely, (although admittedly the TE Team can state so with the advantage of hindsight). For a further discussion on 'risks', the reader is referred to Section 5.4 on 'sustainability and risks'.

Log frame and MTR report recommendations

The Mid-Term Review report (August 2019) therefore suggests reducing the list 28 indicators, removing overlap and duplication to come to a manageable number of indicators and to remove Output 2.1 (financial mechanisms). The tables in Section 5.2 on progress in achieving outcomes (and outputs) indicate which indicators had been removed after the MTR mission. The Evaluation Team reviewed this list of indicators and still found inconsistencies and duplication. The Evaluation Team's recommendations regarding 'indicators' are also discussed reflected in the tables of Section 5.2.

[27] One activity on forest production has been implemented with Korean support (Jeju-Maubara forest), but this was added later and not part of orginal project design

[28] The Mid-Term Review (MTR) report gives the example of a guarantee facility (initiated by the Government) for *all* Timorese private sector operations of USD 4 million

Furthermore, it was suggested for Outcome 1 to broaden the scope from 'biomass energy technology (BET) policy development' to 'renewable energy policy development' in tune with the Government's efforts to have a renewable energy policy and legislation drafted.

3.3 Ratings for project design

The UNDP/GEF rating requirements and criteria for TEs do not include a '**rating on project design and formulation**', except for the item "M&E at design". This is surprising because we think that the 'design' is one of the main factors, alongside 'implementation' and 'external factors' that determine the achievement (or non-achievement) of 'results. The discussion in this Chapter on the Biomass Timor Project design hopefully makes this point clear, stressing the need for high-quality concept formulation with achievable and realistic targets.

In the rating for 'design' of the NAMA project using a six-point rating scheme:

- Highly satisfactory (HS), no shortcomings
- Satisfactory (S), minor shortcomings
- Moderately satisfactory (MS), moderate shortcomings
- Moderately unsatisfactory (MU), significant shortcomings
- Unsatisfactory (U), major shortcomings
- Highly unsatisfactory (HU), severe shortcomings
- U/A = unable to assess.

Box 11 Evaluation ratings of project design and relevance

Evaluation item	Corresponding section	Rating
Design logic and approach; assumptions and risks	Section 3.2	U
Strategy: formulation of the log-frame (outcomes/outputs; choice and values of indicators)	Section 3.2	U
Relevance	Section 3.1	R
M&E at design and entry	Section 4.1	U

Regarding '**relevance', the** rating is on a two-point scale with "R" meaning 'Relevant' and "NR" stands for 'not relevant'.

The rating of the project design is strictly speaking is not part of the TE Team's Terms of Reference. However, the Evaluators have the opinion that the results of the SBEPB Project (as described in Section 5) are partly based on the internal logic in the project design, hence the rating of 'U' for the design logic of outcomes and outputs (in terms of addressing barriers). The major flaw, however, is that the project design is very ambitious given the size and duration of the medium-sized project and the status of the stove market in Timor-Leste. Thus, the strategy behind the project design is rated as "U".

4. FINDINGS: PROJECT IMPLEMENTATION

This part of the Evaluation Report describes the assessment and rating of the quality of the execution by the GEF Implementing Agency (IA), the Project P. An assessment is made of the partnerships established and stakeholder interaction during implementation and the important role of adaptive management. The Evaluation Report presents an assessment and rating of the project monitoring and evaluation (M&E) at implementation. A special section is dedicated to the budget, expenditures, and co-financing of the SBEPB Timor-Leste project.

4.1 Implementation and management

4.1.1 Management arrangements and adaptive management

- Were there any unplanned effects? Which external factors have contributed to or hinder the achievement of the expected results?
- Was adaptive management used or needed to ensure efficient resource use?
- Were objectives, outcomes, and outputs achieved on time?

Management arrangements

This Project is being implemented under a direct implementation modality (DIM) by UNDP. The Biomass Project is managed by a PMU that was led by a Project Manager (also CTA until 2019) who manages a team of longer-term and short-term consultants and project assistants.

Originally, the SSE (State Secretariat for Electricity) was intended to act as a lead partner from the Government of Timor-Leste but after dismantling of the SSE, it was decided to work with the state utility EDTL under the Ministry of Public Works as it is the best entity for driving this project forward.

The Project Steering Committee (PSC) was established at project inception with the mandate to provide overall guidance for the Biomass Project throughout its implementation and be responsible for, amongst other responsibilities, coordination amongst various government agencies, overseeing work carried out by different agencies, monitoring progress and approving plans and reports, and providing oversight to financial management and production of financial reports. The PSC has included representatives from the Ministry of Public Works (MoPW), Ministry of Finance (MoF), Ministry of Commerce, Industry, and Environment (MCIE), Ministry of Agriculture and Fisheries (MAF) and UNDP. The PSC has been chaired by the EDTL National Director for Renewable Energy.

The Biomass Project has held 6 PSC meetings (16 and 22 October in 2016, 30 January in 2017, 7 March in 2018 and 28 January and 24 September in 2019) since the Project Inception workshop on 17 March 2015. Biomass project work plans were prepared for 2016, 2017, 2018 and 2019. The 2016 work plan was reflected in the Inception Report of March 2015

UNDP has provided overall management and guidance from its Country Office in Dili and the Bangkok Regional Hub (BRH) in Bangkok and has been responsible for monitoring and evaluation as well as quality assurance for the project. UNDP has been responsive to the proposed changes when needed, as will be detailed below.

External factors and delays

After the unity government between the two main parties, FRETILIN and CNRT during 2015-2017, the period since the 2017 parliamentary election has been characterized by political instability. The government formed in 2017 was dissolved after not being able to have the state budget approved. This resulted in new elections in May 2018 with a minority government that had the 2019 budget approved but has not been able to end the political deadlock. In January 2020, the parliament failed to approve the budget (again), with the Government continuing on 1/12th of the previous 2019 budget until approved by Parliament. Such political uncertainty has negatively affected the Project in terms of the late start of project implementation, lack of government commitment to co-financing funding and delays in getting proposed legislation (such as the Renewable Energy Law) approved.

The Biomass Project officially commenced in October 2014 but only started implementation effectively at the establishment of the Project Management Unit, early 2016. The project was designed as a 4-year project, terminating in September 2018. However, an 18-month project extension was granted, thereby extending the project closure to 26 March 2020.

The delay did have consequences for the planned UNDP co-financing. The original idea was that the Biomass Project would work in tandem with other UNDP projects under implementation at the same time (in particular, the Social Business project[29]) and thereby create synergy whereby the SBEPB project could lean on Social Business project initiatives, such as small business technical support and financing. However, due to the delayed start of the SBEPB project, the Social Business project had finished by the time the SBEPB project started. This also implied the loss of USD 150,000 of co-financing. The delay and financial constraints in the UNDP Country Office resulted in a reduced allocation of TRAC funds to the project. Of the planned USD 620,000 co-financing grant from UNDP TRAC resources, only USD 216,000 did materialize.

The Project Document is expressing an ambition of realizing 400 industrial stoves to be installed and operational by the project's end. However, it turned out that market conditions had changed since project conceptualization and targets and activities related to industrial stoves had to be changed, as will be discussed below.

Adaptive management

The TE Team observes that to deal with the above-mentioned delays and adverse external factors, the Project Management Unit (and UNDP) has demonstrated adaptive management. This can be seen in the adjustment of the AWPs following the delay in project start and due to restructuring of the government and relatively volatile situation after the 2017 parliamentary election. The latter resulted in changing Project Partners. The Project Document was developed with the State Secretary of Electricity (SSE) as the Implementing Partner, but this had to be changed into EDTL.

Another change has been regarding the market for 'industrial' stoves (tofu making, coffee roasting, salt production, restaurants, bakeries, etc.). As mentioned in the Inception Report, "catering companies" were expected to be a target group for industrial stoves. The Project, therefore, surveyed restaurants to identify the use of fuelwood and the potential for improved stoves. The survey resulted in the conclusion that in urban areas, there is little use of fuelwood in industrial applications since fuelwood is costly and alternative fuels such as LPG but also (subsidized) electricity had become more readily available. Out of 169 restaurants and bakeries surveyed, only 3% was using fuelwood, while 18% was using open fires on the side for certain specific dishes that required a "smoky" taste. It was decided (after a mission by the RTA in 2018) to drop progress indicators in the logical (results) framework and to concentrate on non-industrial stoves (household and institutional stoves). As a result of the Inception Phase, the indicator under Outcome 2.2 was already simplified into "20,000 stoves being used by

[29] See description at the end of Section 2.2

households, institutions and industries installed and operational" to come to more flexibility. Thus, the focus on household and institutional stoves did not result in a different total of stoves targeted, i.e. 20,000.

Other discussions on the Log Frame concentrated on the indicators under Outcome 2.1 This outcome is based on the idea that there would be other UNDP projects under implementation at the same time as the SBEPB project (e.g. the Social Business project) and thereby create synergy whereby the SBEPB project could lean on Social Business project initiatives, in particular, financing for small businesses. Also, it was observed in after a mission by the Bangkok-based UNDP Regional Technical Advisor (RTA) in March 2018 (and again in the RTA's MTR report in 2019) that there no had been no consultation with the financial institutions regarding the financial instruments proposed in the Project Document (such as a loan or guarantee fund). In fact, the main financial instrument in the Project has been subvention amounting to 80% (or more) of the cost price of the stove. Stove producers have limited themselves to produce the number of stoves, as agreed with UNDP, for which they receive 80% of the assumed cost price of the stove (around USD 15). In such circumstances, there has been little need for credit.

Originally the Project followed a distribution model followed by other development partners in the past, in which an NGO "middleman" obtained the stoves from the producers and distributed these to the end-users. In the Project, Mercy Corps acted as such 'middleman', starting in 2018. As implementation of improved cookstoves did not seem to progress much, UNDP and PMU changed course. The 'NGO middleman' was taken out by March 2019 and instead, the Project opted for making the and cookstove businesses (producers, retailers) themselves responsible for their sales to end-users. Apart from increasing the sales of cookstoves in 2019, this has increased the confidence of stove manufacturers and initiating marketing networks into the target beneficiary communities. In some cases, this has enhanced their business profiles and laid a foundation for a future more assertive commercial approach in seeking and developing the market for ICS rather than just waiting for the next development project.

Due to a combination of factors, such as government and UNDP (grant) co-financing not materializing as planned (see Section 4.3 for details on realized co-financing), the volatile political situation, changing market conditions, and realizing the Project results framework's targets were over-ambitious, UNDP decided to lower the ambition level of the Project and to rationalize the number of indicators (and target values). The Output 2.1 (financial incentives and schemes) and related progress indicators were taken out (i.e. the subsidy of 80% remaining, but the proposed loan (risk guarantee) schemes with banks canceled.

4.1.2 Monitoring and evaluation

- Were progress reports produced accurately, timely and respond to reporting requirements including adaptive management changes?
- Whether the risks identified in the project document and progress reports were appropriate and corresponding risk management strategies/systems were adopted and implemented? Were there any unplanned effects?

<u>M&E: design at entry</u>

At Inception, a total of USD 72,000 was allocated, about 4% of the total GEF budget, which is sufficient given the size of the Project. In the M&E plan as formulated in the project documentation, the performance of the Project is monitored and assessed according to the goals defined and agreed upon in the AWPs. The ProDoc also gives a 'standard-type' of M&E Plan of which the main elements are:

- Project Inception Workshop and Project Implementation Workplan:
- Quarterly monitoring of project progress (and update of risk logs in ATLAS); AWP and expenditure reports
- Project Implementation Report (PIR) and PMU Progress

- Project Steering Committee (PSC) meetings
- Mid-Term Review and Terminal Evaluation
- Learning and knowledge sharing: results from the Project to be disseminated within and beyond the project intervention zone through existing information-sharing networks and forums.

M&E implementation; reporting

The 2016-to -2019 annual PIRs provide details of the progress of the Biomass Project in terms of outcomes and indicators. These reports provide information from the Project Manager, UNDP Country Office (CO) and UNDP Regional Technical Advisor (RTA) on progress in the various Project components. The PIRs also provide "critical risk management" details identifying key issues impeding progress or achievement of goals and objectives of the Project, as summarized in the table below.

Box 12 Critical risk mitigation measures undertaken by project management

Examples of critical risk	Risk management measures undertaken
Political	• Due to change in the government system following the 2017 election, EDTL became Implementing partner, replacing the disbanded State Secretariat of Electricity • Related to this change, policy-related works under the project got broadened from biomass-only focus to renewable energy in a wider context (fuels, electricity). In this context, it was decided in 2017 to support the drafting of the RE Law. Due to the political volatility since then, the RE Law remains to be discussed by the Council of Ministers. In general, political instability has made decision-making and budget allocation by government agencies difficult.
Operational	• NGOs have gone through capacity assessments by UNDP with, unfortunately, showed a very low capacity of local NGO implementing partners. It was also observed that local producers remained dependent on Mercy Corps as 'middlemen' between them and end-users. By the end of 2018, the Project changed course by directly engaging with the local NGOs/producers. The idea is that strengthening the producers' business capacity by having them explore markets in communities themselves and sell directly to end-users. • After the delays in 2016-2018, the Project has considerably stepped up efforts in getting ICS distributed through local NGOs. The high level of subsidy (80-90%) remains worrying as it bodes ill for post-project sustainability. As suggested in the MTR report, a new round of subsidy will be introduced (before March 2020) and this time with a lower subsidy level (50%) to learn what (or if) the market is willing to pay for efficient stoves
Financial	• The declining core funding of UNDP and the end of the 'Social Business' project before SBEPB started operation, have implied that the promised TRAC and 'Social Business' co-financing could not be entirely available. The issue was discussed with UNDP senior management but did not result in additional resource mobilization.
Organizational	• Various local implementing partners including NGOs and INGOs and other development partners active in relative issues is promoting their models and approaches of ICS in Timor-Leste. In 2016, a national workshop on Challenges and Opportunities of Promoting ICS was organized to have a more unified approach. • The designed project deemed too ambitious and situation (e.g. market for industrial stoves) had changed after the almost 2-year delays in project start-up. Some assumptions of the project proved to be invalid, in particular regarding the role of financial institutions' willingness to invest in bio-energy uses (and production). Hence, the output on 'financial mechanisms' was canceled after missions by the RTA. Also, in general, the logical framework was critically analyzed, found to be too ambitious and inconsistent, and reformulated after missions by the RTA (in March 2018 and August 2019).

Given the delays and other issues, discussed in the previous Section 4.1.1, the RTA undertook an 'oversight mission' in March 2018. Being a medium-sized project, an 'independent' Mid-Term Review (MTR) was formally not needed. Nonetheless, it was decided to field an MTR mission in September 2018. Whereas the MTR consultant

was recruited and did conduct the MTR mission to Timor-Leste, after the mission the consultant did not follow up on any of the deliverables promised in the contract. Therefore decided (after 6 months) to terminate the MTR consultant's contract. This had a negative effect on the project logframe reformulation and its discussion at PSC level. Instead, an 'informal' MTR mission was carried out in August 2019. This resulted in a revision of the logical framework, which was accepted by the PSC and uploaded in the UNDP ATLAS system afterward. The 2019 PIR reporting is based on this updated framework.

4.2 Stakeholder involvement and relations

- Were the findings, lessons learned and recommendations shared among Project stakeholders for ongoing Project adjustment and improvement?
- Did the Project mainstream gender/ vulnerable groups considerations into its implementation?
- Which partnerships/linkages were facilitated? Can these be considered sustainable? Did the Project take into account local capacity in the design and implementation of the Project?

Stakeholder involvement

During its implementation (2016-2020), the Project has partnered with government entities (Ministry of Public Works-EDTL, Ministry of Agriculture, Forestry & Fisheries), research and training institutes (Dili Institute of Technology; CNEFP), international NGOs (Mercy Corps), national NGOs/producers/importers (Nazareth Foundation, Naroma ba Futuru, Mesak Training Centre; Centru Sover, Ermera Gleno community association; and Startec) as well as development partners (Korean Jeju Island provincial government).

External communication

The project has considerably increased awareness on the use and benefits of energy-efficient stoves. An awareness-raising campaign helped to further communicate the benefits of clean cookstoves.

Box 13 Knowledge activities and products

- https://twitter.com/UNDPTimorLeste/status/1004157015436902400
- https://twitter.com/UNDPTimorLeste/status/1004157686127067136
- https://www.unv.org/our-stories/promoting-energy-efficient-and-low-carbon-appliances-improves-community-health
- http://www.tl.undp.org/content/timor_leste/en/home/all-projects/biomass-project/
- http://www.tl.undp.org/content/timor_leste/en/home/newscentre/articles/2018/renewable-energy-biomass-board-meeting.html
- http://www.tl.undp.org/content/timor_leste/en/home/newscentre/articles/2018/timor-leste-government-participates-in-sustainable-ecotourism-an.html
- http://www.tl.undp.org/content/timor_leste/en/home/newscentre/articles/2017/12/18/undp-facilitates-cooperation-between-jeju-and-timor-leste.html
- http://www.tl.undp.org/content/timor_leste/en/home/newscentre/pressreleases/2018/roadshow-promotes-environmentally-friendly-cook-stoves-with-timo.html
- http://www.sanrimji.com/site/websolution/page/2518.do?p_2518_m_1_scene=article-detail&issueNo=4400&categoryNo=2604&articleNo=26721
- http://m.jejupress.co.kr/news/articleView.html?idxno=85746
- https://www.unv.org/our-stories/promoting-energy-efficient-and-low-carbon-appliances-improves-community-health-and
- https://www.dropbox.com/home/SBEPB%20PIR

A major behavior change campaign was launched using national television and national community radio center covering all municipalities of Timor Leste. A roadshow targeting dissemination of biomass technologies and behavior change campaign was conducted at 10 municipalities and covering 22 major marketplaces of the country. A list of articles, stories, press releases, etc. are given in Box 13.

Gender

The 2019 PIR mentions that 60% of the targeted beneficiaries of the project's woodstove program have been women beneficiaries. Women (and children) are principally responsible for cooking, collection of fuelwoods in Timor-Leste (see also Sections 2.1 and 3.1). The project addressing the issue of indoor air pollution as most cooking takes place indoor in cooking huts, which has associated respiratory and health issues. Promotion of ICS is supporting rural and urban women of Timor-Leste to be able to save time from cooking and from collection firewood. For beneficiary selection, the project focused more on women-led households and also gave special consideration for its targeted subsidy mechanism for widows and disabled.

4.3 Project finance and co-financing

- Were the accounting and financial systems in place adequate for Project management and producing accurate and timely financial information?
- Was Project implementation as cost-effective as originally proposed (planned vs. actual)
- Was the leveraging of funds (co-financing) happening as planned?

Box 14 UNDP/GEF budget and actual expenditures and co-financing data

GEF budget and expenditures

(in USD)	Planned budget (ProDoc)	Expenditures 2015	2016	2017	2018	2019	Expected 2020	Balance
Component 1	125,000	3,666	212,817	147,334	46,302	43,491	-	-328,610
Component 2	1,197,000	13,971	136,516	75,309	330,174	284,169	-	356,860
Component 3	303,000	635	2,364	97,183	25,072	60,648	103,033	14,064
Project management	118,000	7,610	-47,583	37,441	47,145	26,514	-	46,874
TOTAL	**1,743,000**	**25,882**	**304,114**	**357,266**	**448,694**	**414,823**	**103,033**	**89,189**

Co-financing

(in USD)	Type	Planned	Realised	Source
Government of TL	Grant	4,200,000		
	In-kind	1,310,000	850,000	Estimate by TE Team
UNDP (TRAC)	Grant	350,000	261,000	See MTR report
UNDP (project)	In-kind	420,000		
Mercy Corps	Grant	210,000	210,000	PMU
Haburas	In-kind	100,000	60,000	PMU
Startec	Grant	100,000		
Beneficiaries	Cash		40,000	Estimate by TE Team
	TOTAL	**6,690,000**	**1,421,000**	

Note: The data are compiled from the *UNDP ProDoc* and data provided by the PMU/UNDP. Co-financing figures are based on the sources given in the table. The Government in-kind is based on an estimate of the involvement of government entities (Ministry of Public Works-EDTL) in activities (such as RE Law drafting) and participation in workshops and PSC meetings. The beneficiaries' contribution is estimated by assuming that households have paid approximately USD 2 for a stove with about 20,000 stoves sold by the end of 2019.

The GEF budget planned for disbursement of USD 1.74 million over a four-year period, half has been spent in 2018-2019. By the end of the Project (March 2020), about USD 89,189 remains in the balance.

4.4 Ratings of project M&E and project implementation/execution

In assessing 'implementation and adaptive management' of the NAMA Project, a six-point rating scheme is used:

- Highly satisfactory (HS), Implementation of all components, 1) management arrangements, work planning, reporting, project-level monitoring and evaluation, 2) stakeholder engagement and communications, 3) finance and co-finance, is leading to efficient and effective project implementation and adaptive management. The project can be presented as "good practice".
- Satisfactory (S), implementation of most of the components is leading to efficient and effective project implementation and adaptive management except for only few that are subject to remedial action
- Moderately satisfactory (MS), implementation of some of the components is leading to efficient and effective project implementation and adaptive management, with some components requiring remedial action.
- Moderately unsatisfactory (MU), implementation is not leading to efficient and effective project implementation and adaptive, with most components requiring remedial action.
- Unsatisfactory (U), implementation of most of the components is not leading to efficient and effective project implementation and adaptive management.
- Highly unsatisfactory (HU), implementation of none of the components is leading to efficient and effective project implementation and adaptive management.
- U/A = unable to assess.

Given the difficulties in getting the project started, volatile political situation, diminishing co-financing and over-optimistic project design, project management reacted with adaptive management. For example, by changing the stove dissemination approach, early 2019, the number of stoves sold was doubled in 2019. Hence, the TE Team rates implementation as 'satisfactory'.

Box 15 Evaluation ratings of project implementation and execution

Evaluation item	Corresponding report section	Rating
Quality of UNDP implementation and execution (adaptive management; finance; stakeholder involvement)	4.1, 4.2, 4.3	S
Overall UNDP implementation/execution (DIM modality)		**S**
M&E plan implementation	4.1	S

5. FINDINGS: PROGRESS TOWARDS OUTCOMES AND OBJECTIVE

5.1 Introduction

- To what extent have the expected outcomes and objectives of the project been achieved?
- What outputs and outcomes has the project achieved (both qualitative and quantitative results, comparing the expected and realized end-project value of progress indicators of each outcome/output with the baseline value)?

Chapter 5 presents progress towards results. For each of the five project components, as mentioned in Section 1.2, this section assesses the progress in the implementation of the project's outcomes and outputs, following the 'project results framework' format and as reported by the Project Implementation Unit (PIU) in the annual UNDP/GEF Project Implementation Reports (PIRs). The findings are further based on information and documents provided by the PIU to the Evaluators and on interviews with stakeholders.

Section 5.2 describes the progress achieved in outputs and activities for each Component/Outcome, following the outline of outcomes and outputs of Box 6. Section 5.2 tries to provide a quantitative and descriptive overview of the achievements of outputs and outcomes, following the list of outcome indicators as defined in the MTR report. The tables indicate which indicators were deleted or changed as recommended by the MTR. In addition, the TE Team observes that some indicators remained (after the MTR) that overlap with others and this is indicated by using 'strike-out' font.

Section 5.3 provides an assessment of results in terms of attainment of the outcomes and outcome indicators. The baseline and target values of the indicators are taken from the project's logical framework (as reported in the Inception Report and PIRs), while the achievements (i.e. indicator value at project's end, is compiled from PowerPoint presentations made by the project team for the TE mission), supplemented by additional info obtained during the mission (provided by the Project Team) and analysis of the outputs and reports produced during 2015-2019. The greenhouse gas emissions reported have also been reviewed; these are discussed in Section 5.3.3. Section 5.4 discusses sustainability and replicability.

5.2 Progress in achieving outputs and outcomes

5.2.1 Policy and institutional support for deployment and commercialization of advanced bio-energy technologies

Outcome indicators and outputs	Achievements/comments
Outcome 1 **Implementation of strengthened enabling policies, legal and institutional framework for deployment of biomass energy technologies as well as the growth of biomass energy businesses in Timor-Leste.**	
Indicators and end-of-project (EoP) target:	
-) ~~No. of sustainable biomass energy production and clean cook stoves businesses that were proposed and developed as influenced by the strengthened policy and institutional frameworks for the deployment of BETs and biomass energy businesses by Year 2~~ ~~Target: 25~~	25 businesses (MTR) Note; duplicates indicator g) in Outcome 3. TE Team proposes to drop the indicator.
a) No. of policies and legal frameworks that is supportive of RE applications and biomass energy	One (drafting of RE law was supported by project but approval is still pending)

Outcome indicators and outputs	Achievements/comments
business development approved and enforced by Year 3 Target: one by EoP	
b) Volume of funding made available for RE application projects by EOP, US$ 1 million/year	Not made available.
c) No. of relevant GOT agencies and institutions involved in biomass energy production and use of BETs and are linked with each other via a working mechanism for coordination by EOP. Target: 5	Five (a. Ministry of Public Works, b. Ministry of Agriculture, Forestry and Fisheries, c. CNEFP, d. Secretary of State of Environment, and e. Ministry of Commerce, Industry and Environment)
d) No. of satisfied users of the Biomass Energy Resource Information System (BERIS) each year starting Year 2. Target: 200	MTR: The setting up of a Biomass Energy Resource Information System (BERIS) has not been implemented yet
e). No. of local development plans that integrate biomass energy use, BET applications, and biomass industry development prepared by local government men and women planners by EOP	Note: moved from Outcome 5 (Component 3), as the TE Team views it is better placed here, being part of planning
Indicators removed after MTR: • No. of biomass energy utilization projects that are planned and developed for PURE/SURE purposes • Volume of funding made available for BET application projects by EOP, US$ million/year	
Outputs of Outcome 1:	
1.1. Developed and adopted new regulations and technical guidelines for renewable energy technology appraisal and evaluations 1.2. Developed and implemented national strategy plan and roadmap for the promotion of bio-energy production and utilization 1.3 Designed and operational national biomass energy resource inventory 1.4 Modalities and details of participation of community-based organizations and grassroots institutions finalized and agreed	Rather than focusing on bioenergy-specific legislation and regulation, it was decided to focus on renewable energy in general, including bio-energy. The development of the RE Law was supported by the project (see Box CCC) but approval is still pending, although this has to be correlated with the political instability in the country since 2017. The BERIS (Biomass Energy Resource Information System) is still only starting to be developed and faced and faced a considerable delay in its commissioning of consultants to support this effort. Consequently, BERIS will not be finalized before the project's end

Note on 'renewable energy policy and planning'

The activities of the project with the EDTL resulted in the government partners to be more and more interested in looking at renewable energy holistically instead of in biomass cookstoves only. Whereas the project aimed for developing a policy on Biomass Energy Technologies, the government expanded this initiative to develop a Renewable Energy Policy targeting a 50% share of RE in power generation by 2030. The government Implementing Partner did, therefore, request the Project to discuss renewable energy in general and broaden the focus of policy development for just biomass towards policy development for renewable energy in general. However, given the situation of government instability since 2017, no steps have been taken to have the Renewable Energy law officially approved and accepted by the Council of Ministers. There is a coalition government since elections in May 2018, but the newly formed government is not very stable and legislation is very dependent on the coalition partners' approval.

One important achievement is in the realization of local development plans in 10 *sucos* that include plans on biomass and clean cookstoves. As mentioned in the MTR report, one *suco* (in Liquica) managed to transform to 100% clean cookstoves and became a model *suco* for clean cookstoves implementation[30].

[30] Timor-Leste is divided into thirteen municipalities (formerly referred to as districts), which in turn are subdivided into 65 administrative posts (formerly subdisticts), 442 *sucos* (villages), and 2,225 *aldeias* (hamlets). Source: en.wikipedia.org

Box 16 Renewable Energy Law (draft)

The Law will require Timor-Leste to promote the use and production of renewable energy over any other source of energy, while at the same time aiming at achieving universal access to electricity, eliminating the disparity in energy infrastructure between rural and urban areas, and at ensuring the domestic supply of energy and lower dependence on imported energy.

Renewable energy includes electric energy (generated from sources such as solar, wind, ocean (including tidal, wave, current, and thermal), hydroelectric, geothermal, biomass, biological or organic waste, municipal and agricultural waste, landfill gas) as well as clean technologies (including clean cooking methods and stoves, bio-briquettes, and any hybrid technologies or other technology related to the use of biomass, recycled materials).

The Law seeks to strengthen the institutional setup regarding renewable energy in Timor-Leste, by setting up a National Renewable Energy Agency (ANER) to be responsible for overall governance, regulation and administration of renewable energy. The Annual General State Budget shall make provision for specific and adequate appropriations for activities to develop and maintain and renewable energy projects and governance. ANER will be responsible for developing national rural electrification and renewable energy plans. The ANER has the power to set procedures and fees for licenses and concessions for macro-scale (> 2 MW) renewable electricity production. Micro-scale (< 2 MW) projects shall be carried out based on self-management corporativism and environmental protection. A license is not required to install micro-scale renewable energy for household, residential or personal use, while licenses and concessions may be granted to produce energy for other purposes (sale to community, grid, or other)[*)].

Coordinated by ANER, Municipal Renewable Energy Resource Centres (CMER in its Portuguese abbreviation) and Community Renewable Energy Centres (CCER) will be set up. CCERs may engage in any activities related to or necessary for the governance of renewable energy at a local, regional or national level and include developing, maintaining, generating and selling electricity produced from renewable energy. CCERs may be formed as cooperatives under the Law for Cooperatives. CMERs or regional Energy Resource Centres can be set up as cooperative or as part of a local (regional) government structure. The Energy Centres are seen as a way towards (local) energy self-sufficiency and democratic form of governance. They are eligible to receive grants and funding from public and private organizations.

ANER will work with other institutions, including the National Centre for Professional Employment and Training (CNEFP), to provide training and education for the governance of renewable energy

*) In addition, production for the national grid requires a concession (feed-in license) from the regulatory authority/EDTL in accordance with Decree Law No. 13/2003. ANER will approve financial assistance, grants, licenses and concessions in accordance with this Decree Law and any complementary legislation, administrative instrument, policy or plan. ANER will also establish rates, rebates, tariffs, fees, payments and prices, including procedures and fees for licenses and concessions.

5.2.2 Bioenergy investments promotion – Sustainable bioenergy technology demonstration & market development

Outcome indicators and outputs	Achievements/comments
Outcome 2 **Availability of financial support for rural bio-energy production and associated low-carbon technology applications**	
Indicators and end-of-project (EoP) target:	
Indicators removed after MTR: • No. of operational financial support schemes (e.g., loan products) for scaling up and replicating successfully implemented BET projects • No. of local financial institutions that apply the new financial support schemes to support BET • Volume of funds earmarked by participating Fis for financing BET projects by EOP	
Outputs:	
2.1 Designed and implemented end-user subsidies and loan guarantee funding to enable market development for private-sector participation in biomass energy business	Loan, credit guarantee or microcredit schemes have not been implemented and after MTR corresponding indicators were removed.

Note on 'financial mechanism':
During an oversight mission of the RTA in March 2018, this indicator was discussed in light of the ambition to get substantial financial instruments delivered. These were implemented through a government agency or a non-government entity such as a financing institution. This activity will promote close coordination with participating institutions and a commitment from the Government to allocate resources and provide the approved incentives. The latter has not happened due to the politically unstable situation. Regarding the first, at project design, there seems to have been no consultation with the financial institutions targeted for these financial instruments. Given the high subsidy levels of the stoves (80-85%), there has been no need for micro-credit arrangements of end-users. Stove manufacturers/suppliers might need some financial support to invest in expanding businesses and setting up marketing channels into the rural target areas for which these would need loans, but will not do so while remaining unclear what stove market demand would be in the absence subvention. On a positive note, one of the producers interviewed, Blacksmith, mentioned being in contact with a micro-finance organization to be able to provide products they produce (including stoves) using micro-credit after the end of the SBEPB Project.

Outcome indicators and outputs	**Achievements/comments**
Outcome 3 Increased investments in bioenergy **Outcome 4 GHG emissions avoided**	
Indicators and end-of-project (EoP) target:	
f) No. of stoves being used by households and local institutions operational by End of Project (EOP): 20,000	As of March 2020: 21,265 clean cookstoves. By Jul 2016, about 1500 stoves had been sold, by Jul 2018, 4130 stoves, by Jul 2018, 8360 stoves. After changing the stive distribution mechanism with more direct involvement of producers in sales, the number of stoves disseminated increased to 13,630 by July 2019, 14,035 by August 2019 and an expected 21,265 by March 2020,
-. ~~Annual GHG emission reduction from the cost effective and efficient use of biomass energy in rural communities starting Year 4, tons~~	Comment by the TE Team: the indicator duplicates the objective indicator and can be deleted
Outcome indicators and outputs	**Achievements/comments**
Outputs:	
2.2 Implemented and operational 400 locally produced industrial stoves for income generating local enterprises such as tofu/tempe and salt production, bakery and coffee roasting	The output has been removed. After project inception, it was noted that in urban areas, there is little use of fuelwood in industrial applications since fuelwood is costly and alternative fuels such as LPG but also (subsidized) electricity is readily available.
2.3 Implemented and operational locally produced 19,600 energy efficient cook stoves in households and local enterprise/community-based institutions	Distribution of clean cookstoves has met the project target (changed to 20,000), but subsidy levels have not yet been reduced to 40% (the Project's original intention) o reduce but have remained at 80-85%. End-users of a stove costing USD 10-20 (USD 15 on average) are charged only USD 1.5-5 (about USD 2 on average) and in some cases, stoves have been given away for free.
Indicators removed after MTR: • Production of improved cookstoves (ICS); • No. of ICS bought and utilized by consumers annually starting Year 4; • No. of furnaces/stoves installed & being used on a daily basis by households in targeted areas by EOP; • No. of industrial institutional stoves installed and are operational by EOP.; • Total volume of investments on biomass energy technology applications by EOP, US$ million/year; • Annual quantities of sustainable fuel wood produced; • Annual fuel wood savings from the cost-effective and efficient use of biomass energy in rural communities (tons)	

Note on 'industrial stoves'
The project document is expressing an ambition of realizing 400 industrial stoves installed and operational by the end of the project (EoP). Catering-type of companies were expected to be a target group for industrial stoves, in particular. The project, therefore, surveyed restaurants to identify the use of fuelwood and the potential for

improved stoves. The survey resulted in the conclusion that in urban areas, there is little use of fuelwood in industrial applications since fuelwood is costly and alternative fuels such as LPG but also (subsidized) electricity is readily available. Out of 169 restaurants and bakeries surveyed, only 3% was using fuelwood, while 18% was using open fires on the side for certain specific dishes that required a "smoky" taste. The project reconsidered the target of 400 industrial stoves installed and operational.

Note on bioenergy production
During a mission by the RTA in March 2018, it was suggested to put more emphasis on sustainable biomass production and the need to address the entire supply chain when promoting biomass energy technologies. It was suggested that the project expands activities into alternative biomass fuels, on e.g. biomass briquette production with coconut shells or coffee husk.

Following PSC meetings in 2018 and 2019 and a mission by the RTA (March 2018), indeed more attention has been given on alternate fuel generation and technology dissemination. A model biogas plant of 13.6 m^3 was established at CNEFP[31] – the leading vocational training institute of the country. The plant is supporting the preparation of meals of over 150 regular students of CNEFP and has reduced their fuelwood consumption by half.

A new partnership was developed with Jeju Island authority (the island forms a province of the Republic of Korea), the "Jeju-Timor Leste Friendship Forest Project (2017-2019)". This has enabled technical level exchanges from both countries and expected to create considerable technical and financial resource flows to Timor-Leste. The Project has benefitted from this partnership in Lake Maubara area focusing on sustainable hill farming for fuelwood production and bioenergy solutions promotion. A total of 6 hectares of the forest was planted in close partnership with Forest Department, Liquica Municipality Administration, and with local communities to support the fuelwood needs of the local population by the distribution of 200 improved cookstoves[32].

5.2.3 Capacity development and market transformation

Outcome indicators and outputs	Achievements/comments
Outcome 5 **Enhanced capacities of policymakers, financial institutions, entrepreneurs, project developers, communities and end-users on the development of the local BET market**	
Indicators and end-of-project (EoP) target:	
g) No. of local manufacturing firms that can fabricate and install equipment/components used in BET and/or businesses that can market systems by Year 4: 25	The total is seven (07). There are 6 producers (Black Smith, Nazareth Foundation, Naroman Ba Futuru, Centru Sover, Ermera Gleno, Mesak Training Centre) and one importer (Startec)
h) No. of trained and qualified men and women technicians working on and qualified to repair and maintain BET application projects by EOP. Target: 25	Mercy Corps trained 64 ICS producers in 2018, and the Biomass Project trained 7 technicians. Adding training of 24 people on biogas and biomass in CNEFP brings the total of trained people to 95
i) No. of trained and qualified men and women in rural communities gainfully engaged in community forestry and woodlot operations by EOP.	13 people were trained in 2017 (training with the Jeju -Timor Leste Friendship Forest about eco-tourism), of whom two went to Korea in 2018 for training on forestry)
-) ~~No. of local entrepreneurs and SMEs that are gainfully involved in businesses that make up the value chain of the BET application industry by EOP~~	

[31] Digester: 10 m^3 with 3 gasholders with total storage capacity of 3.6 m^3. Efficiency is 36% with gas pressure at 8-10 kilopascal. Investment cost was approximately USD 36,000

[32] An evaluation by the Jeju International Development Cooperation Centre recommended to have post-project management for 2-3 years to ensure that the capacity of the water supply system and management will be at such a level that the forest can survive

Indicators removed after MTR:

- No. of trained men and women technicians who are qualified to repair and maintain BET equipment and installations
- No. of local men and women financial officers that are capable of evaluating biomass energy and other RE project proposals by EOP

Outcome indicators and outputs	Achievements/comments
Outputs:	
3.1 Established and operational Research, Knowledge, Learning and Coordination Centre, leading a network, for Timor-Leste	24 people were trained in 2018 at biomass capacity building training in CNEFP for government officials, DIT, and CNEFP trainees.
3.2 Energy, Industrial and Rural Development planners trained on integrated rural energy planning, low carbon technology promotion and regulatory enforcement 3.3 Public stakeholders, project developers and micro-entrepreneurs trained on bio-energy technology component manufacturing/fabricating; BET project development, consultancy and energy services provision 3.4 Communities and local institutions trained on the installation and maintenance of energy-efficient cookstoves/ furnaces 3.5 Completed site visits to successfully operated BET applications and dialogues with policymakers, regulators, technology developers, entrepreneurs, and financiers	A major behavior change campaign was launched using national television and national community radio center covering all municipalities of Timor-Leste. A roadshow targeting dissemination of biomass technologies and behavior change campaign was conducted at 10 municipalities and covering 22 major marketplaces of the country. See Indicators for other training achievements

5.3 Progress towards the objective

- Will the project achieve its long-term goal and GHG reduction objective?
- How could the Project have been more effective in achieving its results?

5.3.1 Objective and GHG emission reduction

The distribution of 21,265 clean cookstoves (at project's end, March 2020) leads to wood fuel savings, based on which CO_2 emissions avoided can be calculated (see Box 17). From the calculation, it follows that the direct greenhouse gas (GHG) emission reduction (based on the distribution/sale of 21,265 stoves over the project implementation period) is 51,707 tCO_2 per year. Assuming a five-year lifetime of the stove, then the direct cumulative (lifetime) emission reduction is 258,534 tCO_2.

This is less than the targets given in the Project Document (117,145 tCO_2/year, cumulative: 206,633 tCO_2) for the following reasons:

- The ProDoc assumes for household wood stoves an average wood consumption of 11 kg/day, based on the Mercy Corps assessment. However, the figure is for Dili (where few or no Project-linked woodstoves have been sold), while the report mentions that for areas outside Dili municipality the consumption is 9.3 kg/day;
- The ProDoc assumes that 600 institutional and 400 industrial woodstoves will be sold, the use of which is associated with higher wood consumption (50 and 180 kg/day respectively). However, no industrial and few institutional stoves have been sold;
- The ProDoc's cumulative CO_2 target of 206,633 tCO_2 is not the correct way of deriving cumulative emissions from the annual amount. Only the emissions of the project implementation period (4 years) are taken into account. A more representative way is to define cumulative emissions as lifetime emissions of the stoves sold or distributed during the project and then multiply the annual emissions of the stove with the stove's lifetime

Box 17 Calculation of GHG emission reduction due to firewood savings

The greenhouse gas (GHG) emission reduction due to the use of stoves can be calculated using the CDM methodology AMS II G (version 3) - E*nergy Efficiency Measures in Thermal Applications of Non-Renewable Biomass*. It is assumed that in the absence of the project activity, the baseline scenario is the use of fossil fuels for meeting similar thermal energy needs; in the case of rural areas in Timor-Leste, the TE Team has assumed 85% kerosene (stoves) and 15% LPG (stoves).

The annual emission reduction for the total number of stoves distributed by the Project follows from:

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \times N_{y,i} \quad \text{Equation (1)}$$

Where:

- ER_y = Emission reductions during year *y* in t CO_2e
- $B_{y,savings}$ = Quantity of woody biomass that is saved in tons per device
- $f_{NRB,y}$ = Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass (fNRB) values available on the CDM website[14]
- $NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, wet basis)
- $EF_{projected\_fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO_2/TJ[15]
- $N_{y,i}$ = Number of project devices of type *i* operating in year *y*, determined as per paragraph 22

$B_{y,savings}$ is estimated using the following methods:

Where:

- B_{old} = Quantity of woody biomass used in the absence of the project activity in tons per device
- $B_{y,new,survey}$ = Annual quantity of woody biomass used during the project activity in tons per device, determined through a survey
- η_{old} = 1. Efficiency of the device being replaced (fraction); measured using representative sampling methods or based on referenced literature values use weighted average values if more than one type of device is being replaced;
  2. A default value of 0.10 may be optionally used if the replaced device is a three stone fire, or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used
- $\eta_{new,y}$ = Efficiency of the device being deployed as part of the project activity (fraction), as determined annually[12] using the water boiling test (WBT) protocol carried out in accordance with national standards (if available) or international standards or guidelines.[16] Use weighted average values if more than one type of system is being introduced by the project activity

Stoves distributed	21,265	at EoP
Consumption of wood per household (open fire)	9.30	kg/day
Assumptions		
Lifetime of a stove	5	yrs
Efficiency - open fire	10%	
Efficiency - ICS	40%	
Calorific value wood ($NCV_{biomass}$)	15	GJ/ton
Emission factor (EF) - firewood	0.122	tCO_2/GJ
EF - kerosene (85%)	0.0715	tCO_2/GJ
EF - LPG (15%)	0.0613	tCO_2/GJ
f_{NRB}	91%	
Savings		
$EF_{project-fossil\ fuel}$	0.0700	tCO_2/GJ
Quantity wood saved per household (with ICS)	6.98	kg/day
B_y (quantity of wood per device)	2.546	ton/yr
ER_y	51,707	tCO_2/yr
ER - cumulative	258,534	tCO_2

Note: daily wood use per household based on Mercy Corps *Baseline Assesssment.* The f_{NRB} is the value listed on the website https://cdm.unfccc.int/DNA/fNRB/index.html

(based on annual emission reduction of 117,145 tCO_2 mentioned in the ProDoc, lifetime emission reduction would be 5 * 117,145 = 675,214 tCO_2).

Some of the stoves have been smaller in size than foreseen (i.e only a few larger stoves for institutions, but no industrial-type), and thus wood consumption has been lower and consequently the wood and CO_2 emission savings. However, in total, actually more stoves have been distributed than targeted, so the TE Team judges the emission reduction achieved as quite acceptable.

The table in Box 18 provides an overview of the progress of achieving the project goal and objective against the indicators reported in the project's results framework and subsequent PIRs.

Box 18 Development progress (objective and indicators)

Objective: **Goal:**	Reduction of GHG emissions through sustainable production and utilization of biomass energy in the country, and the promotion of innovative low-carbon biomass energy technologies. Removal of barriers to sustainable production and utilization of biomass resources in Timor-Leste and application of biomass energy technologies
Indicators and end-of-project (EoP) target:	
• Quantity of GHG emissions mitigated annually by End of Project (EOP), tCO2e: Target: < 117,145 • Total cumulative quantity of GHG emissions mitigated by EOP, tCO2e Target: 206,633	Direct cumulative emission reduction due to the use of 21,265 stoves amounts to 258,534 tCO_2 (or 51,707 tCO_2 per year) -
• Reduction of non-sustainable fuelwood consumption for energy use in households and industries by EOP, tons. Target: < 192,665 • No. of households and industries that adopted, and are benefiting from, the energy-efficient furnaces/stoves & other BET applications by EOP. Target: up to 20,000	The use of 21,265 household ICS (with savings of 6.98 kg/day/households) implies total annual wood savings of 54,138 tons annually (or 270,690 over the assumed 5-year lifetime of the cooking device) Assuming that households use one device, the total number of beneficiary households is 21,265

However, as will be explained in the next section on 'sustainability', it would be an over-exaggeration to state that the goal "removal of barriers to sustainable production and utilization of biomass resources in Timor-Leste and application of biomass energy technologies" has been reached. As mentioned earlier, the goal was over-ambitiously formulated. One can state, however, that the Project has initiated the first steps towards the removal of the barriers.

5.4 Sustainability

- To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results? How sustainable (or likely to be sustainable) are the outputs and outcomes? Are there any unaddressed barriers remaining?
- Is there an exit strategy that is well planned? What could be done to strengthen exit strategies and ensure the sustainability of interventions made?
- How do the main stakeholders plan to provide sustainability to the project's results in the future? Is there evidence that financial resources are committed to supporting project results after the project has closed?

Sustainability is generally considered to be the likelihood of continued benefits after the project ends. Consequently, the assessment of sustainability considers the risks that are likely to affect the continuation of project outcomes (discussed in detail in Section 5.2). Many risks are in one way or another related to the "barriers" mentioned in the Project Document). The occurrence of the "risks" and failure to implement risk mitigation, implies that it will be more difficult to lower corresponding "barriers" substantially, thus negatively affecting the likeliness of "sustainability" of the project's interventions. The critical "assumptions" then is that the "internal risks" (i.e. risks that can be mitigated or managed by Project management), and 'external risks' have a low incidence and/or impacts, in such a way that sustainability remains (moderately) likely. The quality of adaptive management (mentioned in Section 4.1) is determined by the mitigation response of Project management to these external and internal risk factors as these manifests themselves more intensely and/or more frequently than expected.

In assessing the 'sustainability' of the Project, a simple rating scheme is used:
- Likely (L): negligible risks to sustainability;
- Moderately Likely (ML): moderate risks to sustainability;
- Moderately Unlikely (MU): significant risks to sustainability; and
- Unlikely (U): severe risks to sustainability.

Box 19 Risks and sustainability

Risk (formulated by TE Team, partly based on ProDoc table on 'risks & mitigation'	**ProDoc rating**	**TE Team rating**	**Mitigation carried out SBEPB project** *Gaps remaining*
Institutional, macro-economic and governance			
• The political situation has been volatile with three governments in the project implementation period (2016-2020 and delays in state budget approval • The above has been accompanied by institutional changes (setup [of ministries and agencies) • Legislative processes can take long, relate to the above. The approval of RE Law will take longer than the project lifespan • Timor-Leste's economy is highly dependent on fossil fuel exports (57% in 2010) and coffee (22%). Downturns in these markets or dropping prices easily affect economic development and Government's prioritization (in the view of limited resources) of bioenergy solutions • Lack of ownership regarding the ICS concept and sustainable bioenergy	Moderate	**Risk:** high **Sustainability:** *moderately likely (ML)* (assuming political issues get resolved)	The Project has carried workshops and awareness-raising activities to sensitize government decision-makers. Government representatives participated in the PSC which also forms a platform for discussion. The ProDoc mentions that "this is not considered a significant risk. The 2012 Presidential and Parliamentary elections in Timor-Leste were remarkably peaceful". *While the country has remained peaceful, the ProDoc authors could not foresee the political instability since 2017, which had as a consequence that several important activities could not be finalized. The RE Law is still to be discussed at ministerial level, while the BERIS (intended support well-informed policy making) is still to be developed. Approval of RE Law would be a step forward and also facilitate making state budget available to promote and implement renewable energy options, including bioenergy solutions. Such a signal by the Government would express commitment, and entice private investors to enter into public-private partnerships*
Socio-economic and technical • Insufficient number of households are willing or able to purchase improved cookstoves (ICS) (and renewable energy solutions, in general) at their cost price. • Level of the financial, technical and human capacity of stove producers and low development of marketing/distribution is not conducive for the dissemination of EE stoves	Low	**Risk:** high **Sustainability:** *moderately unlikely* (the market for full-cost stoves remains unclear) *moderately likely* (if households are willing to pay and marketing/ distribution channels can be set up and credit provided for producers and	Training and enhancement of the capacity of relevant agencies and stakeholders is a key component of the current project. Participatory training and demonstrations have been used by stove producers to generate greater ownership. The Project has created knowledge products and awareness using all types of media (TV, radio, newspaper) and using NGOs already working on bioenergy projects. Before implementing the program, conducted an extensive viability study, and in the course of the program, all indications show that very large numbers of households will choose to purchase energy technologies. Hence, the ProDoc rates marketing/distribution risks as 'extremely unlikely. *Alas, the higher upfront cost of bioenergy appliances (improved cookstoves) has proven to be a strong deterrent to consumers. Thus, the ProDoc has been wrong in rating the risk as low. Households are indeed willing to acquire the stove as they see the non-*

Risk (formulated by TE Team, partly based on ProDoc table on 'risks & mitigation'	**ProDoc rating**	**TE Team rating**	**Mitigation carried out SBEPB project** *Gaps remaining*
		micro-credit for end-users)	*monetary benefits (see next row). However, faced with having to spend USD 10-20 dollars ICS, households may prefer the 'open fire' status quo. The situation has been made worse by stove programs in the past that have created an impression that ICS are handed out for free or at a small cost only.* The strategy of the Project has been to lower the subsidy over time from 80% to 50% but has not implemented this. Only in 2020, will the project start some stove dissemination, based on 50% subsidy, but how the market will respond remains unknown. *The Project should conduct surveys among customers of clean cookstoves to gather evidence of user satisfaction levels and willingness/ability to pay and on the experience of customers using clean cookstoves.*
Socio-environmental • Low levels of awareness on the benefits of bioenergy solutions (health, time-savings, environmental) • Difficulties in access to (reliable) info on bioenergy appliance and their environmental and health benefits	N/A	**Risk:** Low **Sustainability:** likely	Timor-Leste is not a country with a deforestation issue comparable to dry-climate countries (see the example of Lesotho, Box 20). People still collect wood without much effort rather than having to purchase wood. Over time, the time spent to gather wood may increase as some deforestation (due to land clearing or logging takes place. The Mercy Corps and other assessments show that end-users are sensible to arguments as time-saving (for women and children) in cooking and firewood collection[33], despite seeing the non-monetary benefits.
Financial • To promote bioenergy in Timor-Leste will require a significant investment on the part of the Government and other development partners. Therefore, the likely risks to be associated with bioenergy (ICS) are that the Government and many of these development partners may be unwilling to put in this quantum of investment	Medium to high	Risk: Medium-High Sustainability: moderately likely (assuming UNDP and partners continue; RE Law gets approved)	The project will put in place a strategic public-private partnership, complementing adequate structures, mechanisms, policy, and legislation that will encourage investment in the sector. As there is currently no indication of other sources being able to continue the high subsidy levels, this raises concern for the sustainability of project results after the project ends *This has not happened as Output 2.2. (on financial mechanisms) was taken out of the activities, while the promised Government co-financing has not been forthcoming in view of the political situation since 2017.*

The reader is also referred to the box on sustainability factors important in improved cookstove programs (see Box 26).

[33] According to the Mercy Corps assessment (2011), people walk 500-1000 metres to fetch firewood, but noting that the job may be combined with working on their farming fields. The time spent is about 6 hours, time which can be reduced by half or more if improved stoves are used

5.5 Ratings of progress towards results and of sustainability

Box 20 Evaluation ratings of progress towards results and sustainability

Evaluation item	Rating	Comment / correspondence with sections in the report
Relevance	R	See rating in Section 3.1
Efficiency	S	See rating in Section 4.4
Effectiveness:	MS	Chapter 5 (progress towards results). Looking only at results, the TE Team would have given MU rating. However, in view of the initial limited capacity and low customer readiness at project start, as well as external factors (delays and government impasse), the Team takes the context into account and gives a MS rating. The main results have been that the Project, unlike stove programs in the past, has showed a path, although at the very beginning, towards a more commercial approach.
• Outcome 1	MU	Section 5.2.1. A RE Law has been drafted, presented, but approval process has stalled due to political situation.
• Outcome 2	MS	Section 5.2.2 The goal of 20,000 stoves has been surpassed, but only with 80-90% subsidy. The Output on financial mechanisms had to be cancelled, although the combination of lower subsidy with micro-credit for end-users could have been pioneered
• Outcome 3	S	Training has been carried out on stoves and bioenergy. While technical capacity has increased and their business profile has increased by means of direct sales and distribution to end-users, but producers (often small NGOs, associations, or social enterprises) have failed to set up a sustainable stove business
Attainment of the objective	MS	Section 5.3. The GHG emission reduction target has been achieved, however, the average outcome rating is 'MS'. While the original ambitious goals of the Project could not be achieved, the Project has made some very first steps towards more creating a more commercial approach by producers, however, doubts on end-user willingness and ability to pay remain
Overall project outcome	HS	Overall project outcome rating,
Financial	MU-ML	The sustainability rating is MU, based on the UNDP-GEF Evaluations Guide that the lowest score of the sustainability subcategories should be taken to rate sustainability. This does not mean that stove business should be abandoned in Timor-Leste, but that market conditions are not such as to see sustainability and replication without outside support.
Socio-economic	MU	
Institutional	ML	
Environmental	L	
Likelihood of sustainability	MU	

Box 21 Examples, Timorese cookstoves





Nazareth Foundation Ermera Blacksmith

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General conclusions

The goal of the Project is the reduction of GHG emissions through sustainable production and utilization of biomass energy in the country, and the promotion of innovative low-carbon biomass energy technologies. Based on the above strategic considerations, the Project focuses on three major components as follows:

- Component 1: Policy and Institutional Support for Deployment and Commercialization of Advanced Bio-energy Technologies.
- Component 2: Bio-energy Investments Promotion – Sustainable Bio-energy Technology Demonstration & Market Development
- Component 3: Capacity Development and Market Transformation

Implementation 1

The project had a difficult start (with an almost 2-year delay between ProDoc signature in 2014 and start of implementation in 2016) and was faced with a challenging political situation over the period 2017-2020). However, the implementation of improved cookstoves substantially progressed in 2019 after the choice for an alternative distribution model where the NGO "middleman" (Mercy Corps) was taken out and cookstove businesses themselves became responsible for their sales. This increased the sales of cookstoves, which has enabled producers to build nascent distribution channels allowing direct contact with prospective customers, and, in the case of some producers, this has increased the confidence of stove in enhancing their business.

As the implementation date of the project was severely delayed, this had implications for some envisaged partnerships. The related UNDP project 'Social Business' ended before the implementation of the SBEPB project started, which not only had implications for co-financing but also for the business and financing development activities of Component 2. Co-financing has also been severely affected by the politically volatile situation with the government co-financing support for bioenergy promotion and development not forthcoming.

Results

The overall **progress** of the SBEPB Project is rated by the TE Team as "*moderately satisfactory*", also considering the above-mentioned challenges. Under Component 1, the Project has supported the draft of the Renewable Energy Law by the Council of Ministries is still pending after several years of discussions. However, the Law remains under discussion and is not likely to be approved until after the political impasse. Also, the BERIS (Biomass Energy Resource Information System) is still only starting to be developed and will not be finalized before the end of the Project.

One achievement has been the realization of local development plans in ten *sucos* that include plans on biomass and clean cookstoves. The project also introduced a model biogas plant the vocational training institute CNEFP (considered a successful pilot), and which created interest from the government to follow up with a biogas plant support program. Under Component 3, promotion campaigns on clean cookstoves concentrated on community radio channels (which have a very high penetration rate in rural areas).

By March 2020, about 21,000 ICS will have been distributed. One big challenge, however, will be in sustainability, since stoves have been sold at 80-85% subsidy. Since no government program or donor-supported program is immediately available, this casts severe doubts on sustainability. A first reaction may be to judge the Project negatively with regards to high levels of subsidy and lack of commercialization in selling stoves. However, the context has been that in the past development organizations almost gave stoves away for free. The Project concept was to lower subsidy over the project implementation period to 50%. In this sense, the Project's approach was an improvement over earlier practices towards a more business-like approach. In the last phase of the Project,

project management will have a new round with 50% subsidy only in February-March 2020 to see how the market reacts. Hopefully, this will give a signal to end-users that the practice of continuing with high subsidy cannot continue, and gives the producers a signal what end-users are really willing to pay.

Design

The project was designed at very high ambition levels. The initial situation was characterized by low capacity at the institutional level and limited technical-managerial capabilities at the level of the producers in a market with changing market conditions (increased supply of LPG and electricity access expansion) and consisting of end-users that had been accustomed to getting 'free' stoves. The expected end-situation was too optimistically sketched in the Project Document. It was unrealistic to assume that an immature market (still in demonstration phase on the innovation ladder) could leapfrog into a pre-commercial market with social enterprises having established fully functioning marketing and distribution channels that can sell to end-users, who are happily willing to pay cost price for the stove; in an enabling environment in which stove retailers and producers are backed up by financial institutions with a pro-active government providing the appropriate legal and regulatory framework. It has been wishful thinking that all this could happen at the same time and in a couple of years only. Woodstove market transformation can be a very lengthy and uncertain process taking 10 or 15 years or more.

Implementation 2

Given the situation of over-ambitious goals and adverse external factors, UNDP and project management have responded within the limits of their ability. For example, the project results framework was reformulated with less ambitious goals and the activities related to setting up financial instruments were canceled, while the stove distribution model was changed to have the cookstove producers (or retailers) more directly involved in stove distribution. UNDP has mentioned to the TE Team that the Project must be seen as the first step from purely donor-driven projects (and heavily subsidized) in the past to a more commercial approach led by local businesses. The TE Team shares this viewpoint. At the debriefing meeting, UNDP management mentioned wanting to continue the efforts of ICS stove dissemination, possibly in combination with other bioenergy utilization and production activities, such as bio-briquettes or sustainable forestry. Given this adaptive management shown during implementation and planned post-project continuation, the TE Team rates '**implementation and execution'** as *'satisfactory'*.

6.2 Sustainability and recommendations

1. **Final SBEPB project activities: end-user survey and evaluation on the 50%-subsidy round of selling stoves**
   Responsible: UNDP

Despite UNDP's wish to continue with bioenergy, the TE Team is quite concerned with regards to the sustainability of the improved stove activities. There is still a need to demonstrate that there is a market in rural areas for clean cookstoves sold at lower subsidy levels, or there are maybe other markets (institutional, urban poor). The last round of selling stoves at a 50% subsidy may give this information. It is suggested that the remaining Project funds are used to carry surveys to gather information on the willingness and ability to pay and on experiences of end-users with the 21,000 stoves that have been distributed. This could answer questions, such as: Are these still used? Do end-users have suggestions for improvements? Do they receive sufficient post-sale support?

2. **Government commitment to promote bioenergy (and ICS in particular)**
   Responsible: Government

Another concern is the government's commitment to bioenergy funding. Once the political situation has stabilized, post-project activities (where and if possible, supported by UNDP) should focus on getting the RE Law approved with the Government making appropriate budget available for implementation of the Law, e.g., by funding (with support by other development partners) bioenergy, bio-briquetting, solar and other renewable and rural energy

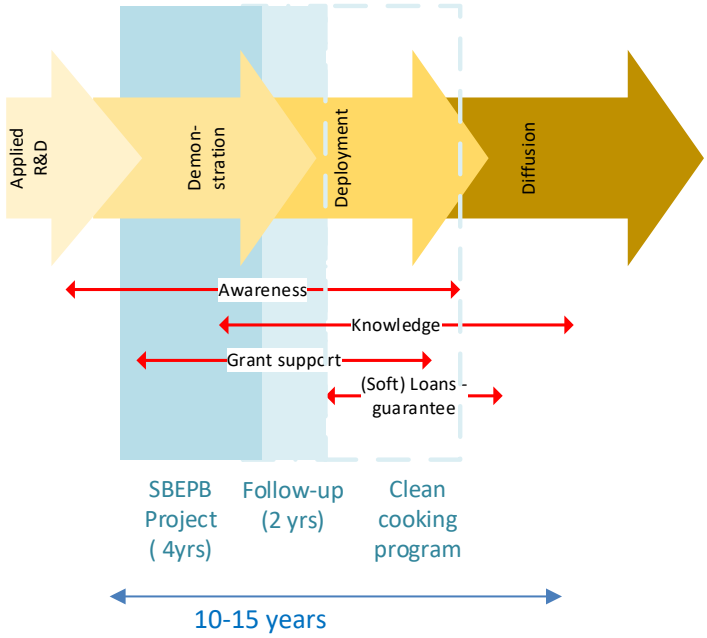
programs. Rather than subsidizing technology, another way forward would be to back up finance (loans, guarantees) for business development, i.e. for producers to innovate and expand and for producers/businesses to set up marketing and distribution channels. Another funding path is to financially support local government to implement local renewable energy development plans (such as the 100% ICS *suco* plans promoted by the Project). A third way is to have other Ministries involved. For example, the Ministry of Education could be involved to integrate clean cookstoves in the school feeding program.

3. **Improve coordination between government, development partners and private sector**
   Responsible: producers (and/or other stakeholders) to form an association
   Responsible: Government (MoPW-EDTL) and UNDP: coordination

The MTR report mentions the idea of setting up an ICS producer association. Maybe, such an association could have a wider stakeholder membership, including development partners and NGOs to enable learning from past experiences, share lessons learned, cooperate in carrying out surveys and assessments, and coordinate funding and program planning. The association could also be a vehicle for future government and/or donor-supported projects to deliver with training for producers on cookstove innovation and business development, raise awareness and facilitate its private sector members to set up marketing, distribution and after-sales support channels.

4. **Follow-up program**
   Responsible: UNDP (in cooperation with MoPW-EDTL)

Box 22 Technology innovation cycle



The current SBEPB Project has supported the demonstration of ICS and, unlike other stove programs in the past, it has encouraged some commercialization by supporting business development of local producers and promoted sales of stoves with a reduced subsidy. However, hampered by external factors (political instability, reduced co-financing, lack of interest shown by financial intermediaries), the Project has not been able to lift the market to the next phase of 'deployment' in its short period (see Box 22). Also, the end-user does not seem to be ready yet to pay a price which is closer to the actual cost of producing and transporting the stove to the end-user. Developing a sustainable and scalable clean cookstove and fuels industry is a long- term effort and will require a commitment of 10-15 years and good coordination between the various public sector and private sector partners. It will take much longer than the typical duration of a donor- or NGO-supported project of a few years only.

This needs the Government's longer-term commitment (setting targets and making budget available), while UNDP could coordinate with other funding and development partners as well as local stakeholders on defining a *follow-up project*. The table in Box 24 gives a summary of actions to be supported in such a program and stakeholders and actors involved, while Box 26 gives an overview of factors that affect the sustainability of cookstove dissemination.

Box 23 Efficient wood stoves in Lesotho

Lesotho has very low rates of forest cover. Deforestation is a serious problem in Lesotho. In 2012, Lesotho's forested areas made up only about 1.6% of the country's land area. Apart from cooking firewood is used for heating, which is eHeating is essential in wintertime with temperature dropping well below zero in the mountainous areas. .With demand for wood outpacing its supply , households often turn to substitutes. Use of other biomass sources, like crop waste and dung, deprive agricultural land of manure and organic matter, contributing to a loss of soil fertility, and thus further exacerbating deforestation (see Box 4).

Approximately 5,000 African Clean Energy (ACE) and 10,000 Solar Lights cook stoves have been sold in Lesotho; the estimated total available market is about 353,000 households. The Government through its research and development centre, Appropriate Technologies Services (ATS), is also developing affordable efficient cook stoves that have a dual function for space heating and lighting.

African Clean Energy (ACE), based in Maseru, is the manufacturer and distributor of the ACE 1 Solar Biomass Energy System (see picture). More than 20,000 stoves have been sold since 2014, of which 5,000 sold in Lesotho (exports take place to Uganda, Cambodia and even USA). The system comes with a stove, which burns most solid biomass (although biomass pellets are recommended), a battery, small PV panel (10 W) and a LED lamp with possibility for mobile charging. See www.africancleanenergy.com

ACE Efficient stove and electricity charger

Financing purchases in this way makes the product highly accessible. According to ACE, a typical rural household spends on average M 325 on energy each month (wood, kerosene). The cost of an ACE stove is USD 120, or M 1,750. An initial down payment of M 250 is required for the stove while the remainder is collected in monthly payments of M 150 over the course of 10 months. ACE works together with micro-finance organisations for rural customers in Lesotho, managing the loans for the customer through its in-house loans team. With significant energy cost savings (80% or M 260), they can be used cover the value of the monthly instalment. Over the coming 5 years, ACE plans to establish 25 Energy Centre (also in the main text of this Section) and a few more with UNDP SE4All support (see Box 16). Once the hub network is complete, ACE should be able to sell more than 40,000 units each year.

SAVE80 stove cooking set (Solar Lights Pty)

Another Maseru-based company, Solar Lights, has sold about 10,000 efficient stoves in the market, supported by the CDM-registered project "Efficient Wood Fuel Stove-Cooking Sets". The stove deployed is the SAVE80 system which consists of custom-fit pots, pans and a heat retaining box (referred to as the 'Wonderbox'). The SAVE80 system saves up to 80% of fuelwood. Costs are M 1,630 – M 3,600 depending on the size of the devices and the number and type of pots. The basic philosophy is to empower rural communities through the establishment of RE User Groups (REUG) and expansion of existing Stove User Groups (SUG)s, allowing for development paths prioritised by the beneficiaries themselves.

Recently, the UNDP-GEF project "*Development of Cornerstone Public Policies and Institutional Capacities to accelerate Sustainable Energy for All (SE4All)"* has been supporting the dissemination of efficient cookstoves. A Call for Proposals was issued, in which a number of companies/NGOs will receive financial support in setting op sales and distribution infrastructure (the products themselves will not be subsidised). The approaches are different. ACE plans to set up a network of 'energy hubs/energy kiosks' were, apart from stoves, other energy-related products (e.g. solar lamps, solar PV) and services (charging mobiles, internet) are offered. Solar Lights will not really set up a infrastructure with physical buildings; the market will be served from working with existing rural shops and working closely with rural energy user groups in the communities.

Source: *Mid-Term Review Report, UNDP/GEF SE4All Project* (by J. van den Akker & R. Lethola), 2019
https://erc.undp.org/evaluation/evaluations/detail/9937

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It is important to note that the basic idea is to move away from the traditional heavily subsidized demonstration projects towards a more commercially oriented deployment phase, in which financing is destined less for product subvention but rather to support stove producers and business with soft loans and guarantee schemes.

Box 24 Elements of an ICS follow-up program and stakeholder involvement

It is important that a follow-up program addressing the various elements of the stove industry value chain in in which the various stakeholders involved work together in a coordinated way.

	Management &funding				Capacity/training			Provide stoves and support				
	Policy and pLnning	Coordination	Funding programmes	Market assessments, monitoring and evaluation	Promotional activities	End-user awareness raising on products and benefits	Training, business and production capacity	Importation and reatil	Supply of raw materials	Design and production	Transport and sale to customer	After-sales eervice
Government ministries and agencies	x	x	x									
Local government		x	x									
Development partners and int'l. NGOs		x	x	x	x	x	x					
(Micro-)finance institutions			x				x				x	
Local NGOs				x	x	x						
Local NGOs/manufacturers					x	x	x			x	x	x
Importers, suppliers, retailers								x	x		x	x
Community groups						x					x	

The design of such follow-up action should be based on an honest assessment of the status of stove supply and demand. The table below gives a summary of favorable and unfavorable factor in the current stove market in Timor-Leste, as viewed by the TE Team.

	Government and enabling environment	**Consumer**	**Cookstove businesses**
Favorable conditions	• Government commitment to renewable energy • Interest and commitment by some development partners (incl. UNDP)	• Cooking indoor (causing IAP) • Minimal awareness on benefits of ICS (time-saving, IAP, environmental) • Interest in alternative cooking devices	• Local employment opportunities • Involvement by local producers in pilot programs
Unfavorable	• Firewood abundancy • Lack of success stories and dependency on high product subsidy • Political instability and lack of government budget allocation • Lack of coordination between stakeholders and short-term project-by-project approach • Very limited reach by (micro-) financial institutions	• Very affordability and willingness to pay (rural/urban poor) • Strong preference for traditional open-fire cooking and cultural attachment • Availability of LPG or electricity, especially in (peri-)urban areas	• Poor manufacturing, business and marketing skills • Lack of scale • Uncertainty on stove market potential

Box 25 Efficient biomass stoves in Cambodia

In the last 20 years the economy has been among the fastest growing in the world, with an average growth rate of 8%. In 2015 the country graduated from low income to lower middle-income and plans to reach middle-income status by 20-2030. The above economic transformation of the country has also caused a strong pressure on land and natural resources, resulting into a dramatic change depletion of the country natural capital. Cambodia has experienced one of the highest worldwide deforestation rates. From 2006 to 2014 the average annual deforestation was close to 3 percent annually and between 2010 and 2014 close to 5 percent annually, due to systematic conversion of forests to agriculture or rubber plantations, although cutting trees for charcoal production also contributes. Biomass (mainly charcoal and firewood) amounts to more than 60% in Cambodia's primary energy mix, while 88% of population relies on traditional biomass for cooking.

To help households manage their woodfuel consumption, the GERES programme developed various improved cookstove technologies suitable for the different markets – rural, peri-urban, urban – and supported commercialization by engaging the private sector, including by establishing an association of producers and distributors (Improved Cookstove Producers and Distributors Association of Cambodia, ICOPRODAC) and supporting the commercial activities of its members, in order to facilitate widescale dissemination of efficient biomass cooking devices.

Over 40 stove production centers nationwide provide local markets with 35.000 improved cookstoves per month. About 4 million efficient stoves have been sold in the period GERES was active, from 1997 to 2016, mainly to types the New Lao Stove and Neang Kongrey Stove.This has benefited 500,000 households (over a population of 15 million). Compared to traditional stoves, these new stoves save 22% in wood consumption. The stove selling price ranges between USD 3.5-5 compared with traditional models around USD 1.50 and the price has been determined in such a way that that the outlay could be recouped due to the fuel savings within six months at the most.

New producers who want to produce the ICS are brought into a producer group and go through mandatory training sessions. This is to ensure that producers are equipped with the right skills. Centralized training centers has been established for this purpose. A promotional campaign was launched to increase knowledge about the stove with the customers. The promotional tools included video clips, posters, cartoons, demonstrations, etc. A micro-credit fund was set up to help establish the production and distribution network.

The project achievements are the result of a 15-year activity, in which GERES worked with a range of stakeholders, suchas MIME (Ministry of Energy) in wood energy planning, Ministry of Environment, and with the Institute of Standards of Cambodia ICS to create a national standard for stoves. Development of the efficient cook stove technology was done in collaboration with existing traditional stove producers. This was done to ensure producer and customer acceptance. GERES cooperated actively with donor and financial partners (ADB, UNDP, World Bank, European Union), bilateral partners (AFD, Australia) and with technical partners (e.g. ENEA Consulting, GACC) and the Asia Regional Cookstove Program (ARECOP)

Source: www.geres.eu; https://energy-access.gnesd.org/projects/36-the-new-lao-cook-stove-project.html

The suggested "follow-up project" should consist of the following elements:

1) Pilot activity with stove producers in disseminating stoves with a 50% subsidy. This will provide important info regarding willingness and ability to pay (that so far has been missing in most stove dissemination activities in Timor-Leste) and whether the willingness/ability to pay differs per area (between rural and semi-urban areas; or between *sucos* depending on income level and wood availability)
2) Market assessment to understand better the demand side. The last detailed assessments by Mercy Corps and GACC are almost 10 years old and the market situation has changed with wider availability of LPG and electricity. The study would encompass:
   a) Results of stove dissemination under SBEPB (with a subsidy of 80% or more, and the results of the pilot activity with selling stoves at 50% subsidy. Important questions here are users satisfied with stoves? Are

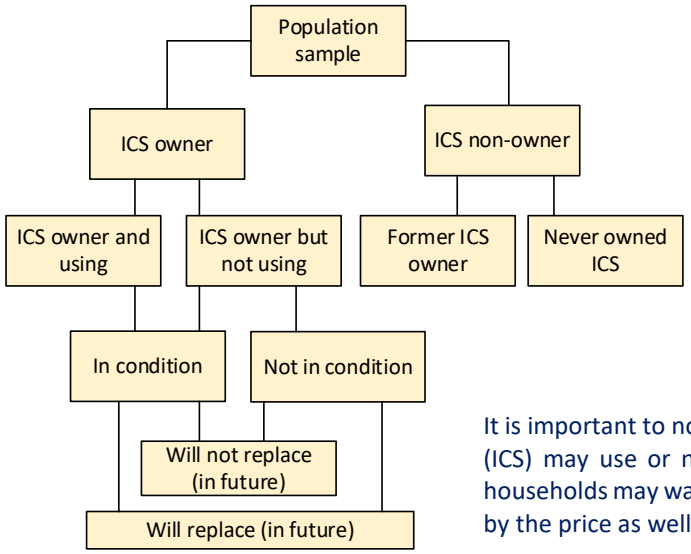
they still using stoves? What would they be willing (and/or able) to pay for a stove? Are other fuels and cooking methods preferred, available and/or affordable? Are stoves maintained or replaced (see Box 26)

b) Exploring new market segments. For example, while the SBEPB Project has focused on rural households, maybe one interesting market segment could be of households in (peri-)urban areas that cannot afford LPG cooking and have to purchase wood or may be interested in affordable and effective bioenergy stoves The market may need different types of stoves, from simple designs to more elaborated ones (see Box 14) with different sizes to serve different market segments and cater for different cooking needs and that can work with different biomass fuels (e.g. bio-briquettes)[34]. For institutional applications (schools or other rural services), cooking on biogas could be of interest;

c) Situation and constraints in the supply side sector (technical and business skills, capacity in marketing and setting up distribution), including the comparative advantages and disadvantages of using fuels (electricity, LPG, fuelwood), comparing initial costs of cooking devices, monthly fuel expenditure, and availability/accessibility[35].

3) Based on the results and recommendations mentioned above, draft a proposal for a larger "clean cooking program". One important goal of the 'follow-up project", would be to get insight in the willingness and ability to pay of market segments (rural/urban, poor/medium/high-income, households/institutional) in various districts (municipalities), before deciding on a 'go/no-go' for a possible larger 'clean cooking program'. The aspect of willingness and ability to pay has so far been largely absent due to the high level of subsidy. The draft proposal should also take into account other factors. Apart from demand and supply-side factors, the policy and market environment conditions from an important aspect (see Box 27). The purpose of a 'medium-term cooking program' is to create the conditions for the market to shift to a larger-scale deployment of stoves (see Box 22). There may still be a need for an initial subsidy (40% or less) but this should decrease over time in a structured manner. Instead, external funds (from Government and development partners) can be better used a (micro-)finance to help set up a functioning stove supply system (marketing, distribution, sales, and after-sales services).

Box 26 Penetration, usage, condition and replacement of ICS



In the case of a low penetration rate (as in Timor-Leste, two sets of data acquisition would be essential to ensure enough observations for creating representative data, a) a representative sample size from the population to allow for conclusions/statements to be made in terms of penetration rata and b) a representative sample size from current cookstove and former owners (in the UNDP SBEPB and possible follow-up activity) to allow for conclusions/statements to be made on usage, condition and replacement rate.

It is important to note that households that may own improved cookstove (ICS) may use or not; the stove may be in good condition or not; and households may want to replace or not. The replacement rate is influenced by the price as well as (after-)sales infrastructure.

Note: adapted from *Sustainability Assessment of Improved Household Cookstove Dissemination ,* GIZ (2014)

[34] The GACC study (2011) distinguishes between rural and urban low income (together 63% of households, earning < USD 5000/yr) rural and urban medium income (24%, earning between USD 5,000-10,000), rural high and urban high income (12%, earning between USD 10,000-20,000) and very high income (> USD 20,000/yr). Rural households formed 75% and urban households 25% in 2010.

[35] A detailed comparison of cooking fuels is outside the scope of this Evaluation. Respondents mentioned that a kerosene stove costs about USD 18-25 dollar. If wood is purchased, expenditures for a family are about USD 1 dollar a day (using three-stone open fire), or half (about UISD 0.50/day) if using a woodstove. With kerosene costs would be 2-3/day and with LPG USD 1.5-2 a day.

It is also important that already in the design of such the follow-up or larger support program, lessons learned from similar efficient stove programs are incorporated from other countries. Box 20 describes the efficient biomass stoves efforts in Lesotho and Box 22 the experiences in Cambodia. Another source of information is the EnDev program, which is being implemented in 25 countries (including Cambodia, Indonesia, Vietnam in the South-East Asian region) and focusing on three areas, 1) access to electricity (households), 2) access to modern cooking (households), and 3) access to modern energy services (by social institutions and small enterprises). Details about the program can be found at www.endev.info.

Box 27 Factors that positively or negatively influence a stove dissemination

Demand side	Supply side
• Awareness on issues and problems (high/increasing) o Market for fuelwood (collected of purchased; price of fuelwood; time needed to collect o Perception and realisation of wood scarcity o Awareness on health problems due to indoor air pollution (reduction of emissions) • Perception of convenience and user satisfaction o Easiness of cooking for variery of meals, respecting cooking habits, appealing design, better performance than baseline (open fire), o Easiness and correctness of using ICS; training or instructions for proper usage o Improvement living conditions (e.g. less workload or smoke exposure for women) • Affordability o Savings in time (wood collection) or money (wood purchase) o Pricing of the stove; willingness to pay and ability to pay (purchase power); option to pay over time (micro-credit; flexible payment) • Availability, accessibility and affordability of alternative cooking methods and fuels (e.g., electricity, LPG, kerosene • Quality and after-sales service o ICS has consistent good quality and durability o Availability of and affordability of repair and maintenance services and of stove replacement	• Market for stoves (number of stoves sold and changes over time) • Capacity of producers and retailers o Business skills and company size; o Technical skills and quality of stoves o Cost of stove production (raw materials, labour, transport and marketing) and access to raw materials o Pricing and need for subsidy; profit for producers and sales people) o Existence of after-sales service o Marketing activities carried out ▪ Knowledge about stove users' needs, preferences and attitudes; ▪ Regular marketing activities carried out (roadshows, demonstrations) with marketing materials ▪ Creation of a 'brand name' ▪ Inclusion of flexible payment (over time in instalments) • Characteristics of stove sector o Degree of organisation (e.g. producer/retailer association) o Type of organisations present: NGO or business (formal or informal) o Competition (number of stove suppliers/sales outlets in an area) • Availability of (micro-)financing for producers (at reasonable conditions)
Policy and market environment	
• Reflection of cooking energy in national policies and strategies with a focus on enabling basic conditions for ICS markets (cross-sectoral: energy, health, environment, forestry, agriculture, education, culture, gender) • Incentive and regulative mechanisms; non-fiscal support o National fund and/or program to support ICS market development (e.g. strengthening ICS supply chain with training; campaigns and awareness raising, R&D; supporting commercial financing schemes) o Taxation, import duties o In case of subvention: existence of an exit strategy (reduction over time); replacement with financing schemes (soft loans and loan risk guarantee schemes) • Role of local government and civil society (relevant NGOs, user groups) in awareness creation	

Source:
Authors, based on *Sustainability Assessment of Improved Household Cookstove Dissemination* (GIZ, 2014)

However, experiences from other countries may not easily be copied and replicated. Lesotho, for example, is a heavily deforested country where households have to walk for miles to collect wood or have to purchase (easily spending USD 1-2 on wood per day). Even if the ACE stove in Lesotho costs USD 120, with a 12-to-15-months credit people can afford the stove paying USD 2 a day (an amount that they otherwise would have spent on wood purchases). In Cambodia, (urban or peri-urban) households purchase charcoal and therefore have a monetary incentive to buy an efficient biomass stove.

6.3 Lessons learned

Project formulation and design

Much importance is given in GEF projects on project indicators. These listed in the results framework and their progress is reported in the annual Project Implementation Reviews (PIRs) against baseline values. In development projects, 'results' are the describable or measurable development that include project outputs, short- to medium-term outcomes, and global environmental and development impacts. One such development impact is market transformation. Having evaluated many UNDP/GEF projects, the international evaluator of the TE Team observe that sometimes there is a tendency for indicators to be over-ambitiously formulated. The SBEPB is one example of this with too many progress indicators that overlap and have unrealistic goals. The Evaluation team suggests that in UNDP/GEF projects, in general, the formulation of progress indicators in the project results framework (logframe) should contain a manageable number of progress indicators.

Another issue is the limited time window of a typical GEF project (3-5 years). However, such a short period seldom coincides with the length of decision-making at the government level where political influence and discussions need a much longer timeframe. A third observation is that for a project that intervenes in existing markets with proven technology (e.g. the stove market in Lesotho, as described in Box 20) it is much easier to have a market transformation impact than in beginning and uncertain markets where technology still needs to be successfully demonstrated (like the stove market in Timor-Leste). Thus, the design should reflect the market and technology innovation situation and this may imply that the ambition for outcomes and progress indicators may be more modest in comparison with similar projects in other (more advanced) countries.

Donor-funded intervention on wood stoves in Timor-Leste has been 'project-by-project' with efficient stove solutions piloted on a trial-and-error basis, but with little capture of iterative learning and limited understanding of underlying consumer segment needs. For project design, the implication is that a) that project goals should be realistically formulated in line with the timeframe of government decision-making; and b) there is need for good coordination at government level (between entities), at donor level (between development partners) and between government and development partners. Efforts should be part of an in a joint framework program so that delays in either project financing, inaction government or other external factors in individual projects can be absorbed by the national program as a whole.

In reviews or evaluations, the context should be taken into account. It is difficult to apply ratings for reviewing (or evaluating) a project like SBEPB without a benchmarking context that allows comparisons to rate progress and assign sustainability with other efficient stove projects. Nonetheless, the TE Team observes that in Timor-Leste, the cookstove industry is in a very early stage with a number of small clay cookstove producers, while the consumers do not seem to be ready yet to pay for efficient stoves. Stove programs in the past were heavily dependent on NGO involvement and subvention, so it takes time to move away from selling based on big subsidy to selling at prices closer to the actual cost.

Cookstove program

Developing a sustainable and scalable clean cookstove and fuels industry is a long-term effort and will require a commitment of 10-15 years and good coordination between the various public sector and private sector partners.

It takes much longer to develop the market than the typical duration of a donor- or NGO-supported projects. These programs often have failed following program completion as beneficiaries revert to traditional cooking methods once their pilot stove breaks and no after-sales infrastructure has been built up.

Another issue is market demand. While end-users can be convinced of the health benefits (especially when cooking indoors), ease of cooking and time-savings in wood collection, they balance these pros against the con of costs of acquiring the stove. Most efficient stove programs are successful in countries and/or in market segments that have to pay for firewood (or charcoal) so that the end-user experiences a clear monetary benefit. Also, the arguments of reducing time for wood collection and on deforestation may not be convincing enough in a situation where there is still an abundance of wood.

Developing a sustainable and scalable clean cookstove and fuels industry is a long-term effort that will require good coordination between the various public sector and private sector partners. The woodstove development in Timor-Leste is only at the beginning of the technology innovation chain. Despite various projects, the stove industry has remained in the early demonstration phase as projects have been implemented in a fragmented way rather than being part of a longer-term program. Also, project design is often based on an overly optimistic assessment of the market's capacity to produce and commercialize and of the prospective customer to pay a certain price for the stove.

In this context, the SBEPB has made some first steps towards developing solutions that address consumer needs without just giving away stoves for free and first commercialization of the stove business. Trying to change the mindset of users and producers away from grants and subsidy, although still in the beginning, is an important achievement of the Biomass Project. A longer-term approach is needed that helps to evolve the market from isolated pilots and demonstration towards a next phase in which stoves are deployed in a more commercial approach as early as possible by stimulating demand for stoves in awareness-raising campaigns, establishing a sustainable pricing/subsidization strategy, and building private sector capacity to establish a distribution infrastructure to support the ongoing supply and maintenance of cookstoves following the initial demonstration and sales.

ANNEX A. TERMS OF REFERENCE (TOR)

Terminal Evaluation of the Promoting Sustainable Bio-energy Production from Biomass In Timor-Leste

Type of Contract: Individual Contract (Consultant)
Duration: Dec 2019 – -Feb 2020 (total 22 working days)
Location: Home based (12 days) + Mission to Timor-Leste 10 days

1. INTRODUCTION / BACKGROUND

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) set out the expectations for a Terminal Evaluation (TE) of the project titled Promoting Sustainable Bio-energy Production from Biomass in Timor-Leste (PIMS# 4250, Atlas# 00088130).
The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects
http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf.

The Project is implemented by UNDP and the *Directorate General for Electricity of Government of Timor-Leste* as the primary government partner. The project *will end in March 2020.*

Project description
The United Nations Development Programme (UNDP), acting as an implementing agency of the Global Environment Facility (GEF), is providing assistance to the Secretary of State for Electricity, in particular to the National Directorate of Renewable Energy (NDRR), to implement the Promoting Sustainable Bio-energy Production from Biomass (SBEPB) in Timor-Leste project. SBEPB focuses on the promotion and use of biomass energy resources for the provision of energy access and services in rural areas. Overall, the Project is expected to result in a reduction of annual biomass/fuel wood consumption in Timor-Leste through the gradual utilization of biomass-based energy systems and efficiency improvements in the rural areas of the country as influenced by the Project. The Project is to facilitate the widespread application of biomass-based energy systems, particularly for economic and social uses in the country's rural areas. The reduction of GHG emissions through the use of more efficient fuel wood technologies and sustainable biomass energy generation in the country will contribute to global GHG emission reductions.

SBEPB project is a four-year program contributing to the reduction of greenhouse emissions through removal of barriers to sustainable production and utilization of biomass resources in Timor-Leste and application of biomass energy technologies to support local economic, environmental and social development. The project is envisioned to increase Timor-Leste's access to clean bioenergy and also create employment through inclusive businesses.

Based on the above strategic considerations, the Project focuses on three major components:

- Component 1: Policy and Institutional Support for Deployment and Commercialization of Advanced Bio-energy Technologies.
- Component 2: Bio-energy Investments Promotion - Sustainable Bio-energy Technology Demonstration & Market Development
- Component 3: Capacity Development and Market Transformation

2. OBJECTIVE AND SCOPE

The project was designed to enhance the capacity of all relevant public and private stakeholders, develop policy and legal bioenergy frameworks for the promotion of energy efficient and low carbon end-use appliances and scaling up of 20,000 improved cook stoves (ICS) in the country. The project is assisting the Government of Timor-Leste in mainstreaming sustainable biomass energy in policy formulation and consequently helping in mitigating the national emission of greenhouse gases resulting from deforestation and the use of non-renewable biomass.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects. The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

The scope of the evaluation will cover all activities undertaken in the framework of the project. The evaluator will compare planned outputs of the project to actual outputs and assess the actual results to determine their contribution to the attainment of the project objectives. It will also attempt to evaluate the efficiency of project management, including the delivery of outputs and activities in terms of quality, quantity, timeliness and cost efficiency as well as features related to the process involved in achieving those outputs and the impacts of the project. The evaluation will also address the underlying causes and issues that contributed to targets not adequately achieved.

The consultant is expected to follow a participatory and consultative approach ensuring engagement with the project team, project partners and all key stakeholders. The consultant should include in the Inception Report a tentative list of all the stakeholders to be met with during the in-country mission as an Annex so that timely support can be provided to arrange those meetings

The consultant is expected to use interviews, focus group discussions, observations at field sites, and any other methodology deemed necessary as a means of collecting data on the performance and success of the project. Questionnaires or any other methodological instruments prepared by the consultant can be distributed to national project partners and beneficiaries, if deemed necessary, facilitated by participating implementing agencies. The international consultant will work with a national consultant who will be guided by the international consultant to carry out various background work, analysis, data collections, translation, facilitation of interviews and focus group discussions and interactions with the beneficiaries, etc.

Evaluation approach and method
An overall approach and method for conducting project terminal evaluations of UNDP supported GEF financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of relevance, effectiveness, efficiency, sustainability, and impact, as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects. A set of questions covering each of these criteria have been drafted and are included with this TOR in Annex C. The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP senior management and programme teams,, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The Interviews will be held with the following organizations and individuals at a minimum: Secretary of State for Electricity; Civil Society; Project Board/Steering Committee members; key stakeholders.

The Evaluator is also expected to visit some of the project sites that will be determined after initial review and assessment of the documents and consultations with stakeholders. In case of in-country travel (if required), local travel cost (transportation, hotel, meals, shall be covered by the project as per actuals.

The evaluator will review all relevant sources of information, such as the project document, project reports – including Annual Progress Reports/Project Implementation Reports, project budget revisions, midterm review, GEF focal area tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in Annex B of this Terms of Reference.

Evaluation Criteria & Ratings
An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework (see Annex A), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: relevance, effectiveness, efficiency, sustainability and impact. Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales are included in Annex D.

A useful tale to include in the evaluation report (where relevant) is set out below:

Rating Project Performance: Using the following 6-point scale: Highly Satisfactory (HS), Satisfactory (S) Moderately Satisfactory (MS), Moderately Unsatisfactory (MU), Unsatisfactory (U), Highly Unsatisfactory (HU)			
1. Monitoring and Evaluation	*rating*	2. IA& EA Execution	*rating*
M&E design at project start up		Quality of UNDP Implementation	
M&E Plan Implementation		Quality of Execution - Executing Agency	
Overall quality of M&E		Overall quality of Implementation / Execution	
3. Assessment of Outcomes	rating	4. Sustainability (4-point scale: Likely (L), Moderately likely (ML); Moderately Unlikely (MU); Unlikely (U)	rating
Relevance: (relevant (R) or not relevant (NR)-2-point scale		Financial resources:	
Effectiveness		Socio-economic:	
Efficiency		Institutional framework and governance:	
Overall Quality of Project Outcome		Environmental :	
		Overall likelihood of risks to sustainability:	
5. Impact: 3-point scale (Significant (S); Minimal (M); Negligible (N)	rating		
Environmental status improvement			
Environmental stress reduction			
Progress towards stress/status change			
Overall Project Results			

Project finance / co-finance

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US$)		Government (mill. US$)		Partner Agency (mill. US$)		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants								
Loans/ Concessions								
• In-kind support								
• Other								
Totals								

Mainstreaming

UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender/vulnerable groups.

Impact

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) Implementation of strengthened enabling policies, legal and institutional framework for deployment of biomass energy technologies as well as the growth of biomass energy businesses in Timor-Leste; b) Availability of financial support for rural bio-energy production and associated low-carbon technology applications
c) Increased investments in Bio-energy; d) GHG emissions avoided from technology applications and investments; and e) Enhanced capacities of policy makers, financial institutions, entrepreneurs, project developers, communities and end-users on the development of the local BET market.

Conclusions, recommendations & lessons

The evaluation report must include a chapter providing a set of conclusions, recommendations and lessons learned. Conclusions should build on findings and backed by evidence. Recommendations should be prioritized,

specific, relevant, and targeted, and given that this is a terminal evaluation, recommendations must be useful for future programming and new project development in same or similar areas for UNDP and the Government. Lessons should have wider applicability to other initiatives across the region, the areas of interventions, and for future programming in Timor Leste.

Implementation arrangements
The principal responsibility for managing this evaluation resides with the UNDP Timor Leste Country Office. The UNDP CO will contract the evaluator and ensure provision of payment installments. The Project Team will be responsible for liaising with the Evaluator to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

Although the consultants should feel free to discuss with the authorities concerned, all matters relevant to its assignment, they are not authorized to make any commitment or statement on behalf of UNDP or GEF or the project management.

Evaluation timeframe
The total duration of the evaluation will be 22X days between Dec 2019 and February 2020 as shown below :

Activity	Timing	Completion Date
Preparation (home based): review of documents and preparation of the Inception Report	4 days	By 31 December 2019
Evaluation Mission to Timor Leste including a debriefing with power point presentation.	10 days in January	By 25 January 2020
Draft Evaluation Report (home based)	5 days	7 February 2020
Final Report (home based)	3 days	24 February 2020

Evaluation deliverables
The evaluator is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
Inception Report	Evaluator elaborates on the methodology and tools for data collection and consultations, process to be followed and stakeholders to be consulted. Also includes a timeline with milestones.	31 December 2019	Evaluator submits to UNDP Country Office which reviews and provides feedback.
Mission debriefing in Power Point slides	Initial Findings	End of evaluation in-country mission	To project management, UNDP Country Office
Draft Evaluation Report	Full report, (per annexed template) with annexes	7 February 2020	Sent to UNDP CO focal point, reviewed by RTA, Programme Unit, GEF OFPs to submit comments and suggestions by mid-Feb 2020
Final Report*	Revised report	24 February 2020	Sent to UNDP CO that wil be responsible for further actions.

*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report.

The report shall be submitted and all further communication with UNDP regarding the implementation of this assignment should be addressed to:
Ms. Felisberta Moniz da SIlva
UNDP Timor Leste Country Office
UN house, Caicoli
Dili, Timor Leste
e-mail: felisberta.dasilva@undp.org

Evaluator Ethics
Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluations'

Evaluation Quality:
The Evaluation Quality will be assessed using UNDP's Independent Evaluation Office's Quality Criteria[36].

Responsibility for Expenses and their Reimbursement
The Consultant will be responsible for all personal administrative and travel expenses associated with undertaking this assignment including office accommodation, printing, stationary, telephone and electronic communications, and report copies incurred in this assignment. For this reason, the contract is prepared as a lump sum contract.

The remuneration of work performed will be conducted as follows:
- First payment: 10% of the total contract upon submission of the inception report and its acceptance by UNDPCountry Office;
- Second payment: 40% of the total contract upon submission of the draft Evaluation Report and its acceptance by UNDP Country Office;
- Third/Final payment: 50% of the total contract upon submission of the final Evaluation Report and its acceptance by UNDP Country Office.

3. Competencies

Required competencies:
- Strong interpersonal skills, communication and diplomatic skills,
- Ability to plan and organize his/her work, efficient in meeting commitments, observing deadlines and achieving results
- Openness to change and ability to receive/integrate feedback
- Ability to work under pressure and stressful situations
- Strong analytical, reporting and writing abilities

4. Qualifications

The Evaluator must be independent from both the policy-making process and the delivery and management of activities in question, i.e. he/she must not have participated in the preparation and/or implementation of the assessed project and must not be in a conflict of interest with project-related activities.
Academic Qualifications/Education and work experience:
- At least a Master's degree in Climate Change, Environmental Management/Engineering/Science, Energy Management, or other closely related field.
- 10 years of experience in programme/project evaluation
- Prior experience in evaluating at least two similar projects in the theme of the project to be evaluated
- Experience working with the GEF or GEF-evaluations;
- Demonstrated understanding of issues related to gender and climate change mitigation (*CCM*); experience in gender sensitive evaluation and analysis;
- Recent knowledge of UNDP's results-based evaluation policies and procedures;
- Significant experience in evaluation of international donor funded development projects;
- Excellent communication and analytical skills;
- Project evaluation/review experiences within United Nations system will be considered an asset;

Language skills:
- Excellent English writing and communication skills

[36] http://web.undp.org/evaluation/guideline/documents/PDF/section-6.pdf

ANNEX B. ITINERARY OF THE EVALUATION MISSION

Date	Description	Time	People met	Topics covered
27/01/20 (Mon)	• Arrival Van den Akker in Dili	12.20 (flight QG500)		
	• Briefing by SBEPB PMU	14:30-17:00		• Briefing on project progress, previous MTR mission and RTA's informal MTR mission, overall project issues, and challenges
28/01/20 (Tue)	Nazareth Foundation (NF), ICS producer (Dili)	9:30-10:30	CPB producer Sabino Soares Janet (NZ Volunteer) Beneficiaries	• NF employs disadvantaged groups (disabled, women-headed households) and produces household stoves (costing around USD 15 w/o subsidy) depending on the size, and costing USD 3 with subsidy. For cost comparison, a kerosene stove may cost USD 25 and the household may spend USD 1 a day. With ICS, if household purchases wood this cost about USD 0.50 a day (with open fire double this amount). They all also make larger institutional stoves (e.g. for schools) costing about USD 120 • Nazareth acted as the financial intermediary through which participating producers in the SBEPB Project were paid • Sold 10000+ since the establishment and about 4250 stoves since Feb 2019 after they became responsible for stoves (before 300 sold through Mercy Corps). NF feels this business model works better. Area of distribution covered six districts, i.e. Dili, Bobonaro, Ainaro, Manufahi, Liquiça and Aileu. • Some issues with project contracting. Commitment to produce more stoves (based on earlier statements) but the UNDP contract mentioned a lower number of stoves. This had some negative implications as materials had been bought already and staff committed • Expressed concerns about the situation after the project ends when there will be no more subsidies. The meeting included interviews with end-users of the stove (women households). While being happy with the performance, in general, low-income families cannot afford to pay USD 15 for a stove in the future. Working with *sucos* and churches will be one way to open access to new markets • The duration of the stoves is at least 3 years based on laboratory tests in DIT

Date	Description	Time	People met	Topics covered
	• Meeting with Mercy Corps	17:00 – 18:00	Mercy Corps - Tate Munro - Margaret McLoughlin - Graziela Xavier - Acacio Barreto	• Issues in Mercy Corps involvement in the Project; shortening of involvement of 2 to 1 year. Sold only 300 in 2018 • Positive signals in the stove market: better design and more players (previously only import). Negative: lack of access to capital by producers; changing mindset of stakeholders and beneficiaries will be difficult: from 100% free distribution to more commercial approach in which users pay (part) of the real cost of the stove
29/01/20 (Wed)	• Naroman ba future (producer, Dili)	09:15-10:00	Naroman office Fredy and team, Beneficiaries	• Naroman is a small producer. Sold about 1100 stoves since Feb 2019 • Stoves cost about USD 15-20 w/o subsidy and costing USD 5-7 with subsidy (with or w/o transport cost). Stoves were given for free to 10 disadvantaged families in Baucau (disabled; widows) • The expectation is that selling cookstoves for the full cost price is possible for regular income earners, otherwise sales will be rather low
	• MoP/EDTL	15.00-16.00	Director Luciano Hornay	• Director of the National Directorate Renewable Energy (NDRE) under the EDTL (Electricidade de Timor Leste) under the Ministry of Public Works. • Interest in rural energy: solar, biogas, bio-briquettes (from bamboo or paper) and ICS). The government can make about USD 1 million/yr available for solar PV (noting that 20% of households not connected to the grid) • Energy law submitted, and MRLAP is in review process.
30/01/20 (Thu)	• Mesak Training Centre	14:00-15:00	Mario Castro and team, beneficiaries	• The Centre is run by students and university alumni. It produces stoves, bio-briquette, and paving made of plastics • Produced more than 600 stoves (115 bio briquettes and 500+ biomass). The group also produces larger-sized bio-briquette stoves to sell to companies (on demand). Most buyers are businessmen and households and interested in bio-briquettes • The stoves sell for about USD 25. The stoves were sold for USD 5 with subsidy under the Project, in Aileu, Dili, and Ermera • Concerns were raised about the late payments in the Project which affected the internal financial and business operation

Date	Description	Time	People met	Topics covered
	• Startech	15:30-16:30	Kim Tchiya	• In the Project distributed about 2300 stoves (which are nearly smoke-free and come from China. The cost is USD 25 dollar (sold at USD 15.50 with subsidy). Startech has been working with Mercy Corps, World Vision, and UNDP
	• Haburas Foundation	17:00 – 18:00	Interim director Pedrito	• Haburas has not been operational for a while, and little information could be given about the previous production • Their bio-briquettes production machine is not used at the moment • However, Haburas has been re-established and continues with new projects
31/01/20 (Fri)	• Meeting and visiting CNEFP • Visiting Maubara-Jeju Forest (with MAF) could not be visited	09:00-11:30	Meeting with staff CNEFP – Director was away to overseas (OZ)	• De Centro Nacional de Emprego e Formação Profissional (CNEFP) offers The CNEFP develops training in the areas of construction, carpentry, electricity, plumbing and masonry, business development. On its premises, it has installed a biogas plant (10 m^3) that can provide gas for cooking meals for about 300-500 people. The plant is fed a mix of cow dung, pig manure, leaves, and food waste.
01-02/02/20 (Sat-Sun)	• Meeting with Centru Sover	09.00-10.00 (Saturday)	Ms Hilly	• With no written contract at the start, the eventual reduction in stoves ordered from UNDP led to financial loss as materials had already been ordered and staff committed. Furthermore, late payments due to UNDP's bureaucracy and the system of payment through a third party (Nazareth) negatively affected the organisation's financial operations • For any future cooperation with UNDP, a good business plan and firm contracts are a condition
	• Drafting TE report			
03/02/20 (Mon)	• Blacksmith (producer), Baucau	Dili – Bacau - Dili	Manuel Pinto (team and beneficiaries)	• Blacksmith makes agricultural tools, including seed storage silos and water tanks. It has produced over 1200 ICS (of which 350 for Mercy Corps during Nov 2018-March 2019). Target was to sell 2500 stoves this year but UNDP later reduced to 1788 which caused a cash flow problem because Blacksmith had already invested in materials and staff time. It also created discontent at the community level where the 2500 beneficiaries were identified and promised a stove that could not be delivered. Late payment (6 months of delay) was another issue creating financial problems for Blacksmith. • The price of the stove is USD 15 (which sold with project subsidy for USD 1.5-2 only. Stoves are sold in villages by door-to-door demonstration.

Date	Description	Time	People met	Topics covered
				• Plans to work with micro-credit organization
04/02/20 (Tue)	• Ermera Gleno (Humboie association) - producer	Dili - Gleno/Ermera - Dili	Adriano (team and beneficiaries	• The association received support to produce silo from FAO and Mercy Corps (for seed storage) and in 2017 training by Mercy Corps to produce ICS. About 1200 stoves have been produced that are distributed for free plus USD 1-2 transportation cost. The aim was 2500 but had to be reduced to 1200 as UNDP financial support turned out to be less. The actual cost of the stove is USD 10-15. Some households would buy when earning cash in the coffee harvest season.
05/02/20 (Wed)	• Preparation of TE report			
06/02/20 (Thu)	• Debriefing with UNDP and with SBEPB PMU	09:00-10.30	Ms Tuya, Berta, Elidio, Firuz, Ermelinda	• Presentation of preliminary results. Discussion on design flaws (unrealistic goals and log frame changes), implementation issues (political volatility, delayed start) and results (20,000 goals reached but with a high level of subsidy). • Suggestions UNDP Team (at first look of the Project subsidy is high, but 80% is a first step away from previous 'free handouts'. These months a trial will be launched with a 50% subsidy to see how the market responds. • The idea of working directly with producers that market their stoves instead of NGO middleman is new. UNDP sees this as the first step towards a more commercial approach and will continue efforts (with GEF or other donor support) while also venturing into bio-briquettes.
	• Departure Van den Akker	13.30		

ANNEX C. LIST OF DOCUMENTS COLLECTED AND REVIEWED

Project design documents and progress reports

- SBEPB project, UNDP Project Document
- SBEPB project, CER (CEO Endorsement Request) document
- Project Implementation Reviews (PIR) 2016, 2017, 2018, 2019
- Project brochure
- Mid-term Review Report (by M. Beerepoot, 2019)

Project reports and products

- Flyer on Renewable Energy Law
- Draft Decree Law on Renewable Energy

Policy documents; reports, articles

- *Access to Energy in Timor-Leste,* PowerPoint by V. Guterres, General-Director of Energy, at: Asian-Pacific Energy Forum, Bangkok, 2013
- *Baseline Assessment Report*, EU Energy for All Programme (E4A), Mercy Corps (2011)
- *Illuminating Market Systems Development in Fragile Environments,* Mercy Corps (2011)
- *Timor-Leste Market Assessment,* Global Alliance for Clean Cookstoves (2011)
  - *Sector Mapping*
  - *Intervention Options*
- *Sector Assessment (Summary), Energy,* Country Partnership Strategy Timor-Leste 2016-2020, Asian Development Bank
- *Plano de Electrificação de Timor-Leste a través de Energias Renováveis,* Martifer (2009)
- *Timor-Leste, Key Issues in Rural Energy Policy,* World Bank (2010)
- *The Potential of Renewable Energy in Timor-Leste: An Assessment for Biomass,* by L.G. Fraga et.al, in: Energies 2019, *12*, 1441

ANNEX D. QUESTIONNAIRE AND EVALUATION MATRIX

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of information	Sources of verification
1. Findings: Relevance and design • Relevance and country drivenness • Stakeholder involvement • Assessment of logframe and M&E design	**Relevance:** • Is the Project relevant to UNDP objectives? • Is the Project relevant to Timor-Leste's environmental objectives? • Does the Project address the needs of target beneficiaries? **Design:** • Is the Project internally coherent in its design? • How is the Project complementary to activities of other stakeholders and donors active in the region or the country? • How did the Project address the priorities and development challenges of targeted beneficiaries? • What changes could have been made (if any) to the design of the Project in order to improve the achievement of the Project's expected results?	**Relevance:** • Extent to which Project supports national energy priorities, policies, and strategies • Coherency and complementarity with other national and donor programmes • Extent to which the GEF climate change focal area is incorporated • Degree to which the project supports aspirations and/or expectations of stakeholders **Design:** • Degree of involvement of stakeholders in the Project design process • Number and type of performance measurement indicators (SMART)	• Desk review of project design and technical documents; Documents from GEF; national policies and strategies; • Interviews with project staff management, project partners (incl. former staff), stakeholders (local and national government entities, private sector, universities/NGOs) and UNDP staff	• Interviews with project partners and stakeholders and analysis thereof • Document and report analysis
2. Findings: Results and effectiveness • Assessment of outcomes and outputs (cf. with baseline indicators) • Effectiveness • Global environmental and other impacts	**Results and effectiveness** • To what extent have the expected outcomes and objectives of the project been achieved? • What outputs and outcomes has the project achieved (both qualitative and quantitative results, comparing the expected and realized end-project value of progress indicators of each outcome/output with the baseline value)? • How could the Project have been more effective in achieving its results?	**Results and effectiveness:** • Level of achievement (as laid out in the logframe) • Achievement of outputs (qualitative, quantitative) and description of activities • Evidence of adaptive management and/or early application of lessons learned	• Desk review of project design and technical documents other relevant docs • Interviews with project staff management, project partners (incl. former staff), stakeholders (local and national government entities, private sector, universities/NGOs) and UNDP staff	• Interviews with project partners and stakeholders and analysis; • Document and report analysis • Check with publicly available information

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of information	Sources of verification
3. Findings: implementation, processes, and efficiency • Management and administration; role of UNIDO • Monitoring and evaluation systems • Stakeholder engagement and communications • Budget, expenditures and co-financing; procurement	**Implementation and management** • Was adaptive management used or needed to ensure efficient resource use? • Were the accounting and financial systems in place adequate for Project management and producing accurate and timely financial information? • Were progress reports produced accurately, timely and respond to reporting requirements including adaptive management changes? • Was Project implementation as cost-effective as originally proposed (planned vs. actual) • Was the leveraging of funds (co-financing) happening as planned? • Were the findings, lessons learned and recommendations shared among Project stakeholders for ongoing Project adjustment and improvement? • Did the Project mainstream gender/ vulnerable groups considerations into its implementation? • Which partnerships/linkages were facilitated? Can these be considered sustainable? Did the Project take into account local capacity in the design and implementation of the Project? • Whether the risks identified in the project document and progress reports were appropriate and corresponding risk management strategies/systems were adopted and implemented? Were there any unplanned effects? • Were objectives, outcomes, and outputs achieved on time?	**Implementation and management** • Extent to which project partners committed time and resources to the project • Extent of the commitment of partners to take over project activities • Evidence of clear roles and responsibilities for operational and management structure **M&E** • Actual use of the M&E system to change or improve decision- making/adaptive management • Share of M&E in the budget • Quality and quantity of progress reports **Stakeholders and communications** • Extent to which project partners committed time and resources to the project • Extent of the commitment of partners to take over project activities **Financial planning** • Extent to which inputs have been of suitable quality and available when required to allow the Project to achieve the expected results;	• Desk review of project design and technical documents (incl, PIRs; data on budget; other relevant docs; media coverage, official notices and press releases • Interviews with project staff management, project partners (incl. former staff), stakeholders (local and national government entities, private sector, universities/NGOs) and UNDP staff • Interviews with project experts (national and international)	• Interviews with project partners and stakeholders and analysis thereof • Document and report analysis
4. Findings: sustainability and impact • Risks and external factors • Replication	**Sustainability** • Are sustainability issues adequately integrated in Project design? • Did the Project adequately address financial and economic sustainability issues? • Is there evidence that Project partners will continue their activities beyond Project support? • Are policies and frameworks being addressed through the Project, in order to address the sustainability of key initiatives and reforms?	**Sustainability** • Extent to which risks and assumptions are adequate and are reflected in the project documentation • Extent to which project is likely to be sustainable beyond the project; • Extent to which main stakeholders plan to provide sustainability to the project's	• Desk review of project design and technical documents (incl, PIRs; other relevant docs) • Interviews with project staff management, project	• Interviews with project partners and stakeholders and analysis thereof • Document and report

Contents	Model evaluation criteria and/or questions	Indicator(s)	Means and sources of information	Sources of verification
	• Is the capacity in place at the national and local levels adequate to ensure the sustainability of the results achieved to date? • Are Project activities and results being replicated elsewhere and/or scaled up? • What are the main challenges that may hinder the sustainability of results? **Impact** • Will the project achieve its long-term goal and GHG reduction objective? • How could the Project have been more effective in achieving its results?	results in the future, including the commitment of financial resources	partners (incl. former staff), stakeholders (local and national government entities, private sector, universities/NGOs) and UNDP staff	analysis* • Check with international practices and publicly available information
5. Conclusions and recommendations • Conclusions on attainment of objectives and results • Lessons learned • Recommendations	• Evaluation conclusions related to the project's achievements and shortfalls (comprehensive and balanced statements which highlight the strengths, weaknesses and results of the project, including a summary of evaluation criteria[37]: Relevance, Effectiveness, Efficiency, Sustainability, Impacts • What lessons can be learnt from the project? • What recommendations, if any, can be made to follow up or reinforce initial benefits from the project; Proposals for future directions related to the main objectives	• Ratings of evaluation criteria • Lessons that have been learned regarding the achievement of outcomes and efficiency (implementation) • Recommendations for post-project and future actions	• Interviews with project staff and partners • Desk review of project docs and reports as well as external policy and other docs	• Interviews with project partners and stakeholders and analysis thereof • Document and report analysis

[37] Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels? Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved? Efficiency: Was the project implemented efficiently and cost-effectively, in line with international and national norms and standards? Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results? Impacts: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental or other impacts?

ANNEX E. CONSULTANT CODE OF CONDUCT FORM

Evaluators/reviewers:

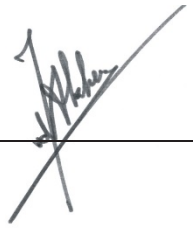
1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well-founded
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals and must balance evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners, and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings, and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation/reviewer Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: J.H.A. VAN DEN AKKER (Team Leader)
Name of Consultancy Organization (where relevant): _____
I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Westerhoven, Netherlands
Signature: _____



ANNEX F. ABOUT THE EVALUATORS

Mr. Johannes (Jan) H.A. van den Akker is a technology management scientist with a Master's degree from Eindhoven University of Technology (Netherlands), specializing in international development cooperation. He is an expert on sustainable energy policy and technologies. Mr. Van den Akker specializes in studies and analytical work, project design and development, project coordination and implementation, project monitoring and evaluation, knowledge management, capacity strengthening and public-private partnerships in the field of sustainable energy strategies, energy efficiency, energy technologies and supply, climate change and the Clean Development Mechanism. He has lived and worked abroad for over 7 years in Zambia, Mexico, and Thailand. In addition, has undertaken numerous short missions to about 45 countries in Africa, Latin America, and Asia & the Pacific.

In 2003/2004, he founded ASCENDIS, as an independent office, and has been providing consultancy on sustainable energy and climate change, specializing in development issues. ASCENDIS is based in Westerhoven, Netherlands, but offers services in Africa, Asia and the Pacific, Europe and Latin America & the Caribbean, often by associating itself with local freelance experts, professionals, and organizations. As a long-term expert with the United Nations system, Mr. Van den Akker has provided advice to governments and organizations on the design of investment and capacity building programs for UNEP, UNDP and UNIDO (mostly in GEF-funded activities), UNFCCC, European Commission and for NGOs/consultancy companies (e.g., Practical Action Consulting, Winrock, GFA) in the area of renewable energy, energy efficiency, and sustainable transportation.

As an independent consultant, he has reviewed and evaluated about 40 GEF-funded sustainable energy projects and assisted in the design of 42 sustainable energy projects, mostly for UNDP. He worked as UNDP Regional Technical Advisor on climate change mitigation (in Eastern and Southern Africa) during 2007-2009 and as Key Expert in the European Union Technical Assistance Facility for Sustainable Energy for All (2015-16). He also worked as Technical Advisor in the implementation of individual sustainable energy projects in Guatemala, Peru, and Malawi and as a renewable energy expert in the EU project on off-grid electrification in Zambia (2018).

Mr. Eurico Ediana da Costa is an experienced consultant with a master’s degree in business administration (MBA) from Auckland University of Technology (New Zealand). Specializing in global business, and business operation management. He is an expert on social entrepreneurs, and sustainable business strategy and development. Mr da Costa has demonstrated history of work in the area of business supply chain, quality management system, community development, social business, export and import, decentralization, strategic development plan, project management, operation and management, monitoring and evaluation, capacity building, negotiation, policy analysis, business analysis, human resource management, and problem-solving.

Mr da Costa is a co-founder of a local NGO, Hametin Demokrasia no Igualdade (HDI), based in Ermera. HDI has been working in the area of monitoring and evaluation, community development, conflict resolution, youth development, and capacity building. Additionally, he works with various stakeholders from universities (researchers), government, United Nations, international and national NGOs. Currently, he works as a technical advisor for Ministry of Transport and Communication (of Timor-Leste) to assist in transport operation management, strategic transportation system, develop cooperation with development agencies and ASEAN to establish Cross Border transportation system, port strategic plan, and ensure strategic and effective implementation of land transport plan.

ANNEX G. AUDIT TRAIL

Annexed in a separate document