Terminal Evaluation (TE)

Thailand: Promoting Renewable Energy in Mae Hong Son Province (MHS-RE) UNDP-GEF Project

December 15, 2017

GEF Project ID: 3359

UNDP PIMS: 3908

#1 MHS RE Option – a $4.50 standard cook stove (left) - and a $9 (250 Baht) Improved Cook Stove (right) that uses 30-50% less firewood and lasts twice as long as a standard cook stove

#2 MHS RE Option- $90 (3000 Baht) Complete Solar Home System that is already commercially available in MHS City with 3*1W LED Lamps, 2 USB Ports, Li-Ion Battery, & credible 1-year guarantee

GEF Strategic Program:

- Program 3: Promoting market approaches for renewable energy
- Program 4: Promoting sustainable energy production from biomass.

Implementing Agency: UNDP

Implementing Partners: Thailand Environment Institute (TEI) NGO in Phase 1 (2011 - 2013) and UNDP-Direct Implementation Modality (DIM) in Phase 2 (2014 - 2017)

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The Terminal Evaluation was undertaken from September to December 2017

Acknowledgements

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PROJECT SUMMARY TABLE

Project Title: Thailand: Promoting Renewable Energy in Mae Hong Son Province (MHS-RE)				
GEF Project ID:	3359		*at endorsement (Million US$)*	*at completion (Million US$)*
UNDP Project ID:	PIMS 3908	GEF financing:	$2,712,700	$2,673,245.02
Country:	Thailand	IA/EA own:	$550,000	$76,500.00
Region:	Asia Pacific	Government:	$2,870,000	$179,333.33
Focal Area:	Climate Change Mitigation	Other:	$5,900,000	$4,183.33
Operational Program:	GEF-4 CC-SP3, CC-SP4	Total co-financing:	$9,320,000	$260,016.66

Executing Agency:	TEI (2010-2013) UNDP (2014-2017)	Total Project Cost:	$12,032,700	$2,933,261.68
Other Partners involved:	Mae Hong Son Province, Ministry of Energy	Prodoc Signature (date project began): 23 December 2010		
		(Operational) Closing Date:	Proposed: 31 Dec 17	Actual:

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EXECUTIVE SUMMARY

BRIEF PROJECT DESCRIPTION

The "Promoting Renewable Energy in Mae Hong Son Province" (MHS-RE project) is a (GEF) financed project implemented from 2010 to 2017 with support from the United Nations Development Programme (UNDP).The MHS-RE project design phase started in 2007, and the ProDoc was approved and signed in 2010. The total GEF contribution was USD 2,712,700.

The stated project objective was to overcome barriers to the provision of RE in integrated provincial RE programmes in Thailand. Secondary objectives included assisting MHS in achieving 100% energy self-sufficiency, and facilitating a significant reduction in GHG emissions through the development and application of RE technologies. The project was to contribute to the Goal of Thailand's GEF strategy, which was to mobilize GEF resources in support of the implementation of Sufficiency Economy principles, as enshrined in the 10th National Economic and Social Development Plan.

The stated problem that the MHS-RE project was seeking to address was that the Thailand government's commitments in its national RE target was not being translated into suitable real action in MHS Province (and the neighboring provinces of Chiang Mai, Chiang Rai and Tak). This lack of translation of national RE targets to local action was primarily seen to be a lack of integrated provincial and local governmental planning policies. The project design also stated that new approaches, concepts and policies would be developed and applied, e.g. new ownership models for RE systems, and improvements to tariff systems and loan management. Also, information on existing incentives/policies for RE promotion, which were available but were sometimes seldom used, would be disseminated and promoted. Mae Hong Son Province, in the North-West of Thailand along the border with Myanmar, was designated in 2006 by the Thailand Ministry of Energy to be the first energy self-sufficient province in Thailand.

The expected project results of the MHS-RE's four outcomes was:

1) Strengthened institutional, organisation and social capacity results in planning, management and implementation of integrated RE programmes in MHS, Chiang Rai, Chiang Mai and Tak Provinces

2) Financially sustainable RE systems operational in MHS, Chiang Rai, Chiang Mai and Tak Provinces

3) Technical support to be locally available for the development, management and maintenance of RE applications in MHS, Chiang Rai, Chiang Mai and Tak Provinces

4) Policies in place to facilitate up-scaling and replication of RE systems in rural Thailand

The results expected in the ProDoc by the End-Of-Project (EOP) were an installed RE capacity of up to 11.8 MW from 20 new demo hydro power plants and one biomass residue / wood chip 1 MW demo power plant. The demo power plants were to be mainly in MHS Province, but also included 2 new hydros in Chiang Mai Province and one new hydro in Tak Province. The 21 RE demos were already identified and in the pipeline of projects to be funded and installed by other Thai government agencies (PEA and DEDE) and to start operating from 2010 to 2015. The MHS-RE project was set to claim 100% of the projected 20-year GHG emission savings from the 21 RE demos - on the basis that the MHS-RE's project's capacity building activities meant that none of the 21 demos would not have occurred without the MHS-RE project's support.

As recommended by the mid term review undertaken in 2013, a comprehensive strategic review was undertaken to draw a line under the mostly unsuccessful 1st Phase of the project and develop a new 2nd Phase for the project. The strategic review recommended a one-year no-cost extension, which was agreed and endorsed. For the 2nd phase, the project was re-scoped, with significant changes made to the framework, scope and focus. There was also a move to a Direct Implementation Modality (DIM) by UNDP, which replaced the previous NGO Implementation Modality by the Thailand Environment Institute (TEI).

A more new specific context for the project was developed in the 'Addendum to the ProDoc' of 2014 which was that: (1) A cooperative ownership model was promising for micro-hydropower which used water flows that are community resources; (2) Project interventions concerning hydropower needed to be very specific and focused, aimed at overcoming the legal barrier for realization of community based off-grid micro- and mini- hydropower plants; and (3) the reformulated MHS-RE project was also to focus on on-grid solar, SHS rehabilitation and solar lanterns, Improved Cook Stoves(ICS), Biodigesters, integrated RE planning at the MHS Provincial levels, and rooftop solar and EE measures in government buildings.

The context and problem to be solved in the 2nd phase of the MHS-RE project was still to give effect to the government's RE objectives, but now for this to be primarily achieved via RE technology demos in off-grid RE applications in MHS, rather than the on-grid predominantly micro hydropower demos of the 1st phase of the MHS-RE project. But critically: (1) the legal challenges to building micro-hydro power in protected forestry areas was more explicitly recognised; and (2) although there was a more direct emphasis of the 2nd stage of the project to assisting tangible (esp. off-grid micro hydropower) demos, the mass replication of demos was still assumed to be primarily through enhanced policy effectiveness and knowledge dissemination, rather than through direct support of mass replications based on the demos.

At the end of the second phase of the project, the reformulated expected outcomes were:

- 1 on-grid solar farm project approved, installed and operational (500 kW);
- 100 SHS rehabilitated (100*120 Wp);
- 200 solar lanterns sold (200*2.5W);
- 20 additional biodigesters at schools, SMEs and farms installed and operational;
- 2 off-grid hydropower plants approved, installed and operational (2 * 30 kW);
- 10 solar rooftop systems approved, installed and operational (10 * 200 W);
- 1 EE project in government building approved, implemented and operational (RE capacity 600 W savings);
- 10 villages in which ICS have been tried out and being used in MHS by end of 2016 (50 systems).

Direct reduction of GHG emissions due to operation of these systems (in the reformulated project) was expected to be about 14,216 tonnes of CO_2.

There were thus effectively two very different stages in the MHS-RE project. The 1st stage MHS-RE project was implemented by TEI from 2010 to 2013.The 2nd stage of the MHS-RE project was implemented by UNDP under DIM from 2014 to 2017. Key adjustments made to the MHS-RE project in its 2nd stage starting in May 2014 included: a refocusing of the project from primarily on-grid RE to primarily off-grid RE technology applications; an adjustment of approach to be specific RE technology focused rather than on financial mechanisms and wider market awareness, reducing the project's implementation focus to just MHS province; refocused expected outcomes; and reduced expected GHG emission reductions.

PROJECT RESULTS

The project results are being judged against the reformulated objectives developed in the 2014 strategic review, documented in the 'Addendum to the ProDoc' of June 2014, and endorsed by the MHS Province governor and UNDP.

Project Objective, Outcome and Output Results

Achievement Level	Reformulated (2014) Target Indicator (by the end of the project)	Results

Objective To overcome barriers to the provision of Renewable Energy (RE) services in integrated provincial renewable energy programmes in Thailand	Additional RE power generation capacity of 500 kW (solar farm) and 60 kW (off grid hydro) and several solar applications realized. (Note 2010 ProDoc Indicator was RE power generation capacity in MHS amounts to 29,720 MW (on grid) and more than 315 kW (off- grid)	20.78 kW (on-grid) and 25.97 kW (off-grid) RE capacity added
	At least 3 new models for RE generation & application developed and operational. Models ready to be replicated in other areas (hydro, solar and biodigesters).	7 RE models developed
Outcome 1: Strengthened institutional, organizational and social capacity results in planning, management and implementation of integrated RE programmes in MHS	At least 2 RE projects proposed by government agencies in line with provincial plan	22 RE project proposals submitted throughout the project
	At least 3 management models established (off-grid hydro, biodigesters, solar)	7 models established.
Outcome 2: Financially sustainable RE systems operational in MHS	1 additional on-grid solar farm project approved, installed and operational in MHS by end of 2016 (capacity 500 kW).	Not achieved. Remaining funds reallocated to solar rooftops support.
	100 SHS (Solar Home Systems) rehabilitated in MHS by end of 2016 (100*120 Wp)	171 (each of 120 Wp) SHS rehabilitated
	200 solar lanterns sold in MHS by end of 2016 (200*2.5W)	485 solar lantern realized (sold/ bartered/ crowd funded)
	20 additional biodigesters at schools, SMEs and farms installed and operational in MHS by end of 2016 with support from project (average size 8 m3)	31 biodigesters size 8 m3 installed (10 in schools + 21 in households)
	2 off-grid hydropower plants approved, installed and operational in MHS by end of 2016 (2 * 30 kW). (was 9 off-grid hydropower units in ProDoc	Not achieved

	10 solar rooftop systems approved, installed and operational in MHS by end of 2016 (with support from the project) (10 * 200 W)	Total of 65.78 kWp (30 times the target capacity) installed at 8 government & private buildings with 50% funding support by the project by EOP
	1 EE project in a government building approved, implemented and operational in MHS by end of 2016 (RE capacity 600 W savings)	3 government building EE projects implemented
	10 villages in which ICS have been tried out and being used in MHS by end of 2016 (50 systems)	42 villages of 3 ethnic groups with 415 units of ICS realized and being used
Outcome 3: Technical support is available locally for the development, management and maintenance of RE applications in MHS	4 village technicians trained to operate and maintain off-grid hydropower plant by end of 2016	No longer applicable as off-grid hydropower found to not be implementable
	10 village technicians trained to maintain rehabilitated SHS by end of 2016	- 10 village/district technicians trained - Total of 1,353 persons trained
	2 government technicians trained on EE measures and solar rooftop installation	11 government & private technicians trained
	20 users of biodigesters trained to operate and maintain the systems	165 biodigester users trained
	Improved design for ICS suitable for MHS finalized	Improved design for ICS suitable for MHS finalized and ICS trialed by 55 project volunteers.
Outcome 4: Policies facilitate up-scaling and replication of RE systems in Thailand	By end of 2016 all lessons learned documented and published	- 2 lessons learned on micro hydropower and ICS completed and presented; - 1 ICS article published on UNDP website; - 1 video (Thai) on ICS operational mechanism completed - 7 lessons learned - RE curriculum for school piloted

	Centre of learning approved and operational by end of 2016	2 RE learning centers established at (1) Ban Pang Tong School and (2) the 17th Infantry Regiment Task Force
	At least 2 guidelines for replication published e.g. a) on management models for off-grid applications b) incentive schemes/financial model for RE	3 guidelines published and disseminated to concerned agencies and users
	At least 2 important lessons learned included in policy making at central level	2 lessons learn and study on MHS RE special development zone included in policy making at central level

So it can be seen that for the reformulated project objectives, all of the output indicators were achieved, except for the micro-hydro and the solar farm demos. The planned 500 kW solar farm demo output was partly replaced by the 30 times increased capacity of the target kW (65.78 kw versus a target of 2kW) of solar roofs achieved. However, the 2nd stage MHS-RE project's inability to achieve any of the 2 off-grid hydro demos follows the failure to achieve any of the 29 primarily on grid hydro demos in the 1st phase, and for the same reason, namely that permission to build and operate the demo hydros was denied by DNP due to the sites being located in protected/forestry areas. In spite of strenuous efforts by the MHS-RE project, this DNP permission could not be obtained. This DNP approval risk was not specifically flagged in the original ProDoc[1]. In the reformulated 'Addendum to the ProDoc' the risk was better known and was rated as 'moderate'. The risk was to mitigated by arguing that the community benefits of off-grid hydro and that the comprehensive support from Provincial Authorities could overcome the DNP focus on strictly enforcing protected/forestry area values. This proved not to be the case. Hence, the DNP approval to build hydros located in protected/forestry areas hydro demo risk was under-rated throughout the project.

The four key tangible RE technology-applications successfully demonstrated from the MHS-RE project are (1) Improved Cook Stoves (ICS): (2) rehabilitation of existing Solar Home Systems (SHS) and the promotion of solar lanterns (3); grid connected rooftop solar PV; and (4) biodigesters for

[1] It is argued that although there have been long standing regulations prohibiting the use of protected areas for hydropower, it was only in 2012 that the regulations were strictly enforced.

farmers and schools with confined swine (pigs).

Although the MHS-RE project did not explicitly specify securing post-project end replication as an objective, the $2.775 Million Thailand Energy for Environment Foundation (EforE) follow-on MHS RE project has been approved by the Thailand Energy Conservation Fund, and this EforE project started on 01 October 2017. The EforE project will build-on the MHS-RE results.

EVALUATION RATING TABLE

Evaluation Ratings:			
1. Monitoring and Evaluation	*Rating*	2. IA & EA Execution	*Rating*
M&E design at entry	MS	Quality of UNDP Implementation – Implementing Agency (IA)	S
M&E Plan Implementation	S	Quality of Execution - Executing Agency (EA)	S
Overall quality of M&E	S	Overall quality of Implementation / Execution	S
3. Assessment of Outcomes	*Rating*	4. Sustainability	*Rating*
Relevance	R	Financial resources	L
Effectiveness	MS	Socio-political	L
Efficiency	MS	Institutional framework and governance	L
Overall Project Outcome Rating	MS	Environmental	L
		Overall likelihood of sustainability	L

SUMMARY CONCLUSIONS, RECOMMENDATIONS AND LESSONS

CONCLUSIONS:

1) The MHS-RE project successfully demonstrated adaptive management and achieved useful results for (1) Improved Cook Stoves (ICS); (2) Solar Home Systems (SHS) and Solar Lanterns; (3) Grid-connected solar-PV rooftop systems for self-consumption; (4) RE Policy Support and Integration; and (5) RE Learning Centers. Useful results were also achieved for Biodigesters.

2) The MHS-RE project supported ICS, SHS and Solar Lanterns, and grid connected solar roofs are sound RE technologies that are likely to be copied (replicated) in MHS[2].
3) Key MHS RE stakeholders appreciated the project's contributions.
4) However, both the original and reformulated project designs did not fully identify or fully document the: real existing situation facing the uptake of RE in MHS, in particular: the ongoing growth in grid electricity supply in MHS; a lack of clarity on what were the core RE problems; a comprehensive analysis of user willingness and ability to pay; the supply chains that already existed in the towns and villages of MHS for cook stoves, SHS supply and maintenance, and solar lanterns; and a documented barrier removal and demonstration-replication approach for each RE Technology-Application.
5) Stakeholders still expect ongoing subsidised RE equipment and support in future.
6) The applicable RE Technology-Applications were poorly defined in the MHS-RE project.
7) Multiple funders and donors support RE in MHS and Thailand, the MHS-RE project was just one of many past and present similar RE technology focused projects and activities in MHS and Thailand.

RECOMMENDATIONS

1) It is recommended that the already approved MHS EforE follow-on project develops comprehensive formal 'Technology-Application Packages' for: (1) Improved Cook Stoves (ICS); (2) Solar Home Systems (SHS) and solar lanterns; (3) Grid-connected solar-PV rooftop systems for user self-consumption; (4) RE Learning Centers; (5) MHS RE Policy Support and Integration; and (6) Biodigesters (but only in very specific applications in MHS).
2) It is recommended that the six (6) 'Technology-Application Packages' in the EforE project include: explicit linkages from project activities and demonstrations to mass-market replications; specific RE technology and application assessments and future prospects; current costs and likely cost trends; end-user willingness and ability to pay; reliance or not on future subsidies; building on existing supply chain considerations; and long term sustainability.
3) It is recommended that the already approved MHS EforE follow-on project maps out for each of the six (6) 'Technology-Application Packages' demonstrations and replications: key players and critical success factors; clear selection criteria for the demos; clear expectations for demo recipients to assist in replications; identification of end-to-end approval processes for demos/replications; and clear mapping of how the demos will lead to project supported replications, and ultimately to market-led post-project mass replications without support.

1) By the Thailand Energy for Environment Foundation (EforE) $2.775 Million (92 Million Baht) follow-on project to the MHS-RE project that has been approved and that started on 01 October 2017.

4) It is recommended that the already approved MHS EforE project maps out for each of the six (6) 'Technology-Application Packages' how it will prioritise working with and building on existing local RE equipment and technical support market suppliers.

LESSONS LEARNED

1) The 1st lesson learned from the MHS-RE project is that each specific RE application needs a detailed and comprehensive understanding of key approval and success factors at the design.
2) The 2nd lesson learned from the MHS-RE project for the successor EforE project is to identify and target the appropriate RE technology for the specific application. For example the SHS' provided in large numbers by the Thai government in the 2000's were expensive 1st cost and maintenance cost large capacity and expensive 220V AC systems. It was found during the project that a simpler packaged 4500 Baht[3] DC PV system could be developed that many rural households in MHS really want or need, rather than setting up financing mechanisms and technical support to maintain the existing 220V AC systems.
3) The 3rd lesson learned from the MHS-RE project is to look at the ability of users to pay, and not assume that all rural households are desperately poor. For example, nearly every MHS rural household has somehow afforded a 10,000 Baht motorcycle and 150 Baht of petrol every 1 - 4 weeks. So most MHS rural households could pay for a 300 Baht ICS and a 150 Baht solar lantern.
4) The 4th lesson learned from the MHS-RE project is to plan for scaling up supply if the demo-replication approach is successful. For example, the production of ICS needs to increase by a factor of a hundred from the small-scale hand made ICS approach successfully piloted to date.
5) The 5th lesson from the MHS-RE project is that RE projects of this type should keep an explicit long term focus on the ultimate mass scaling up of RE technologies-applications required – rather than just on a few demos and hope that the demos somehow get replicated. A Key part of this is to look for and utilise existing supply chains, rather than develop new supply chains from scratch[4].

[3] Note that the project had identified the need and found an inventor and was talking about encouraging the manufacture of a 4500 Baht mini SHS. However, by asking around MHS town, the TE team found an existing satellite dish supplier in MHS town who had already identified and sourced and was selling packaged 3000 Baht ($90) mini SHS, see the picture on the cover of this report for this 3000 Baht mini-SHS system.

[4] For example, truckloads of 300 standard cook stoves are already delivered in MHS for a total delivered price of 30,000 Baht. The challenge now is to get ICS production increased - from the current hand-made 50 ICS per month delivered by a project supplied pickup to a project distribution network - to a point where merchants can fill up a truck with 300 ICS every day or two and then deliver the truckload of ICS to existing MHS stores through their existing supply chains to MHS towns. And MHS rural villages are already served by merchants in pickups who buy and sell various goods to householders, including through existing village small stores, so these merchants could supply ICS to village based stores in MHS.

ACRONYMS AND ABBREVIATIONS

AC	Alternating Current
AFD	French Development Agency
APR-PIR	Annual Project Review / Project Implementation Report
BGET	Border Green Energy Team
BOO	Building Own Operate
BRH	Bangkok Regional Hub
BTOR	Back-to-Office Report
CC	Climate Change
CEO	Chief Executive Officer
CO	UNDP Country Office
CO_2	Carbon Dioxide
CPAP	Country Program Action Plan
CSR	Corporate Social Responsibility
DC	Direct Current
DEDE	Department of Alternative Energy Development and Efficiency
DIM	Direct Implementation Modality
DNP/DNR	Department of National Park, Wildlife, and Plant Conservation
DO	Development Objectives
EA	Executing Agency
EE	Energy Efficiency
EforE	Energy for Environment Foundation
EGAT	Electricity Generating Authority of Thailand
EOP	End-Of-Project
GEF	Global Environment Facility
GEF OFP	GEF Operational Focal Point
GHG	Green House Gas

GW	Gigawatts
HH	Household
IA	Implement Agency
ICS	Improved Cook Stoves
kV	Kilovolt
kW	Kilowatt
LED	Light-Emitting Diode
LFA	Logical Framework Analysis
M&E	Monitoring and Evaluation
MHP	Micro Hydro Project
MHS	Mae Hong Son Province
MTE	Mid-term Evaluation
MTR	Mid-Term Review
MW	Megawatts
NIM	National Implementation Modality
O&M	Operation and Maintenance
PEA	Provincial Electricity Authority
PMU	Project Management Unit
ProDoc	Project Document
PV	Photovoltaic
RE	Renewable Energy
REDP	Renewable Energy Development Plan
RFD	Royal Forest Department
RFP	Request For Proposals
RTA	Regional Technical Advisor
SHS	Solar Home System
SPP	Small Power Producer

TE	Terminal Evaluation
TEI	Thailand Environmental Institute
USB	Universal Serial Bus
VSPP	Very Small Power Producer
W	Watt
Wp	Watt peak

I. INTRODUCTION

1.1 PURPOSE OF THE FINAL EVALUATION

The overall purpose of the MHS-RE terminal evaluation is to measure the relevance, effectiveness, efficiency, impact and sustainability of project activities in relation to the project's stated objectives endorsed by GEF, including the agreed changes made as result of the 2013 mid term review (and subsequently detailed in the 2014 strategic review) with regards to outputs, timeframe, project implementation and results. The terminal evaluation has the following specific purposes:

a) To promote MHS-RE project accountability and transparency by assessing the levels of outputs and success that the project achieved, and the extent that they will likely continue after the MHS-RE project's end in December 2017;

b) To ascertain and articulate lessons learned from the MHS-RE project that might help improve the selection, design and implementation of the new 2.5 year duration Energy for Environment (EforE) RE project in MHS that started on 01 October 2017 with $2.8 million (92 million Baht) funding from the Thailand Energy Conservation Fund, and for further GEF projects in Thailand and elsewhere.

As was the case in the MHS-RE project, it is not unusual for GEF projects to face a situation where one or more component or activities did not initially perform to expectations. Consequently the MHS-RE terminal evaluation also assessed how the project undertook adaptive management approaches to improve its final results, following it's 2013 mid-term review and the agreed updated LogFrame and results matrix from the 2014 strategic review, in addition to drawing lessons that can be used to improve the sustainability of MHS-RE project benefits.

Terminal Evaluations play a critical role in supporting accountability. The emphasis of the evaluation mainly focused on major issues and challenges that the project has had to overcome from its inception phase to its:

Project Indicators The evaluation assessed the achievement towards indicators related to expected outcomes, planned duration, budget and co-financing of the project.

Implementation The evaluation assessed the implementation of the project in terms of quality and timeliness of inputs and efficiency, the effectiveness of activities carried out and the responses to evaluation recommendations made during the mid-term evaluation in 2013 and the 2014 strategic review.

Project Outputs, Outcomes and Impact The evaluation assessed the outputs, outcomes and impacts achieved by the project as well as the likely sustainability of project results.

The primary audience for this terminal evaluation is GEF (the Global Environmental Facility) through the UNDP (the UN Development Programme) Thailand country office (UNDP Thailand CO) and the Bangkok Regional Hub (BRH) Office. The secondary evaluation audiences are the Royal Thai government, especially the Ministry of Energy, the Ministry of Natural Resources and Environment, the Thai GEF Operational Focal Point (GEF OFP), the Mae Hong Son provincial government, project stakeholders, beneficiaries, and the following MHS RE EforE project.

This terminal evaluation will focus on providing evidence and information for GEF and UNDP regarding: what MHS-RE components and activities have worked well and why; which have not worked so well and why; lessons learned; replication/ scaling-up potentials, and recommendations on how future on-grid and off-grid RE activities in MHS, in Thailand and other countries can be better targeted, designed and implemented.

The evaluation will be framed by using the UNDP-GEF overarching evaluation criteria of project relevance, effectiveness, efficiency, sustainability, and impact. The terminal evaluation has followed a participatory and consultative approach, based on the review of MHS-RE project documents and the evaluation field mission in Mae Hong Son Province, Chiang Mai and Bangkok.

1.2 SCOPE AND METHODOLOGY

The evaluation links the MHS-RE project's context, design and strategic review, assumptions, planning, implementation, risk management, and adaptive management of the components and activities to the outputs, outcomes and lessons learned and recommendations that can be drawn from the project. This section outlines the proposed evaluation approach; data collection methods, sources, analytical approaches; and the evaluation timeline.

The MHS-RE TE evaluation team has followed the TOR established for the MHS-RE TE in the TE Procurement Notice and TOR of April 2017. The objectives of the evaluation are to assess the achievement of projects 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 evaluation will cover the criteria of relevance, effectiveness, efficiency, sustainability, and impact of the MHS-RE project using a set of questions, as provided by UNDP and as modified by the evaluation International Consultant, and found in Annex F of this Report.

The MHS-RE TE evaluation started with a desk review of key relevant documents. The evaluation mission work started on 16 October 2017 in Bangkok with meetings with relevant UNDP Thailand CO (Country Office) and project management staff, and then with meetings with key project stakeholders and appropriate site visits in MHS and in the northwest Thailand regional center of Chiang Mai. There was then a preliminary results' report back of initial findings on 26 October to UNDP in Bangkok. The

MHS-RE Team Leader then worked from his home office to draft the terminal evaluation report (working remotely with the national expert), this was followed by updating the draft report to reflect comments provided by UNDP and other stakeholders consulted by the project to conclude a final draft for submission, together with the required annexes and audit trail.

The evaluation methodology used was to review all relevant documents and obtain face-to-face feedback of the project's progress and results from as wide as possible a range of stakeholders (a comprehensive stakeholders list was provided by the Thailand UNDP CO and UNDP and then refined as appropriate by the evaluation team). Individual meetings were be held with project beneficiaries and key stakeholders. Key evaluation issues and conclusions were checked with independent evidence and consolidated into an evaluation report organized under the headings provided in the TE TOR (see Annex G). The evaluation was undertaken in a fully professional manner by a highly experienced GEF project and clean energy project evaluator and Thai national expert. The MHS-RE TE was undertaken to fully meet UNDP and GEF reporting requirements.

DESK REVIEW

The desk review looked at the original project design document (ProDoc), the TOR for the mid-term evaluation (MTE), the MTE report, the Addendum to the ProDoc (essentially the 2nd phase MHS-RE's project's redesigned ProDoc), and the latest (August 2017) Project Monitoring Report. From these documents, the evaluation team captured the key project background data. The evaluation team then reviewed the remaining UNDP documents provided to the evaluation team to complete the desk review before the evaluation mission commenced on 16 October 2017.

The initial desk review provided the necessary context for the field evaluation, preparing the evaluation team for the refinement of data collection tools, and to identify any data gaps.

DATA COLLECTION

The MHS-RE TE evaluation team used a mixed-methods approach to collect data for the evaluation. There were two phases of data collection: 1) desk review and 2) fieldwork involving Key Informant Interviews (KIIs).

In terms of location, the evaluation team focused on data collection in Bangkok, MHS and in Chiang Mai. This location focus was because the MHS-RE project was not been significantly active in the neighboring provinces to MHS, although that was the intent in the original design and as stated in the ProDoc.

A list of respondents for the Key Informant Interviews was created based on a initial list provided by UNDP, and the evaluation team's suggestions, from an extensive list of MHS-RE Project participants provided by UNDP

Due care was be taken by the evaluation team to avoid any significant bias regarding the MHS-RE project design, situation and baseline analysis, implementation, risk assessment and management, project outputs/results and so forth.

The evaluation team has utilized the tools for measuring GHG mitigation that have been developed for

the Global Environmental Facility (GEF)[5]. These tools give a standardized way to estimate direct and indirect GHG savings, both for during the project implementation period and following the end of the implementation period.

FIELD WORK

The evaluation team spent six working days in MHS and 2 working days in Chiang Mai. Following arrival in Bangkok of the international evaluation team leader, the evaluation team met with the UNDP Thailand country office in Bangkok. This was an opportunity to present the evaluation work plan and discuss any UNDP questions or clarifications sought on the work plan. At the end of the evaluation mission, preliminary analysis and findings were presented to the UNDP country office and to the UNDP Asia-Pacific Bangkok regional center's RTA (Regional Technical Advisor). Throughout the fieldwork phase of the evaluation, the evaluation team kept detailed interview notes. The evaluation team worked closely with relevant UNDP country office and UNDP Asia-Pacific Bangkok Regional Hub (BRH) staff during the evaluation mission, to maximise the information gained during the evaluation mission.

DATA ANALYSIS AND REPORTING

The evaluation team examined evidence from all data sources using a combination of pre/post, descriptive, and qualitative and quantitative analysis. The findings from these analyses were used to triangulate findings in response to each evaluation question, and allow the evaluation team to substantiate conclusions. All findings were supported with quantitative project performance monitoring data where possible, as well as other program documentation, interviewee information gained, and other secondary data identified during the fieldwork evaluation phase.

Findings examined both intended and unintended impacts affecting women and men, discussed gender-sensitive issues, and were disaggregated by sex as appropriate. The evaluation team worked together to begin data analysis following the data collection mission phase in Thailand. Data analysis continued after the field-based work - in late October and in November 2017.

LIMITATIONS

The following limitations are noted for consideration and awareness:

- Identifying contributions to higher-level outcomes from capacity building interventions is intrinsically difficult. The evaluation team therefore relied on the widely utilized tools available from GEF (the Global Environmental Facility), which has been funding GHG mitigation projects worldwide with strong capacity building elements since 1992.
- Response bias of respondents. The evaluation team has built on the list of key respondents provided by UNDP to identify respondents with varying programmatic experiences. The evaluation team provided clear communication to all respondents regarding the purpose of the evaluation, highlighting the evaluation team's role as external evaluators, and the utility of providing the evaluation team with honest responses.

[5]Calculating GHG Benefits of GEF Energy Efficiency Projects - v1.0 - GEF STAP, March 2013, and Manual for Calculating GHG Benefits of GEF Energy Efficiency & Renewable Energy Projects - GEF/C.33/Inf.18 April 16, 2008

- It was not possible in the short field evaluation mission to have enough information to fully identify the specific gender constraints pertinent to the MHS-RE context. However, the evaluation team included a suitably experienced female national expert who assisted in gender related data gathering and analysis.
- The evaluation team relied on triangulation of data and information from experts to assess the reasonableness of impact assumptions.
- The evaluation team identified political or business constraints that arose during the program implementation phase that were not envisaged at the time of program design, but this was not a comprehensive list. The evaluation team worked to establish a strong rapport with beneficiaries to enable honest and open responses.
- The tight timeframes for conducting a complex multi-dimensional data collection effort were challenging. To mitigate this, the evaluation team made efficient use of time and resources, close communication within the team and with UNDP, and the ability to adapt and solve data collection problems on the spot. These challenges are not unfamiliar or insurmountable to the evaluation team, and both members of the evaluation team have encountered and overcome such issues before in previous evaluations.

1.3 STRUCTURE OF THE EVALUATION REPORT

This terminal evaluation report is presented as follows:

- The project description and its development context, from the project design and mid term review and strategic review reformulation, and an overview of project implementation from the commencement of operations in March 2010 until the latest available August 2017 M&E Report, and the project's expected results;
- Review of project results based on project design, reformulation, and execution;
- Conclusions and recommendations that can increase the performance of similar projects in Thailand;
- Lessons learned from implementation of the project from ProDoc final signature in December 2010 to the planned project close in December 2017.

This evaluation has taken into consideration the Guidance for conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Project (2012)[6].

Key Issues Addressed:

As specified in the GEF Monitoring and Evaluation Policy, this Terminal Evaluation assesses:

[6] http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf

- The achievement of outputs and outcomes and provides ratings for the targeted objectives and outcomes;
- The likelihood of sustaining the achieved outcomes at project termination, and provides ratings for the project's outcomes.

As per GEF requirements, this terminal evaluation report explores five major criteria:

1) Relevance: the extent to which an activity is suited to local and national development priorities and organizational policies, including changes over time.
2) Effectiveness: the extent to which an objective has been achieved or how likely it is to be achieved.
3) Efficiency: the extent to which results have been delivered with the least cost to resources as possible.
4) Results: the positive and negative, foreseen and unforeseen, changes to and effects produced by a development intervention. In GEF terms, results include direct project outputs, short- to medium-term outcomes, and longer-term impacts including global environmental benefits, replication effects and other local effects.
5) Sustainability: the likely ability of an intervention to continue to deliver benefits for an extended period of time after project completion. Projects need to be environmentally as well as financially and socially sustainable.

This Terminal Evaluation serves as an agent of change and plays a critical role in supporting accountability. The emphasis of the evaluation mainly focused on major issues and challenges the project had to deal with from its design to the end of its implementation period:

- Project indicators The evaluation assessed the Milestones toward indicators related to expected outcomes, planned duration and budget and co-financing of the project.
- Implementation The evaluation assessed the implementation of the project in terms of quality and timeliness of inputs and efficiency, the effectiveness of activities carried out and the responses to evaluation recommendations made during the mid-term evaluation.
- Project outputs, outcomes and impact The evaluation assessed the outputs, outcomes and impacts achieved by the project as well as the likely sustainability of project results.

At the stage of the final evaluation, the evaluation team mainly dealt with issues related to the sustainability of the major outcomes, the likely replication of similar project initiatives, the project implementation scheme and the lessons learnt.

2. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

2.1 PROJECT START AND DURATION

The RE-MHS project was formulated in 2007, the Project Document (ProDoc) was approved by GEF in February 2010, and the MHS Provincial Government signed the ProDoc on 23 December 2010. The project was a 5-year project, set to end in December 2015. The mid term review (completed in August 2013) recommended that a strategic review be undertaken to draw a line under the mostly unsuccessful 1st Phase of the project and develop a new 2nd Phase for the project. The strategic review recommended a one-year no-cost extension, which was duly agreed by the project steering committee and endorsed by UNDP-GEF. A further one-year no cost extension was later requested, agreed and endorsed. The project is now scheduled to end in December 2017.

2.2 OBJECTIVES OF THE PROJECT

The stated project objective was to *overcome barriers to the provision of renewable energy services in integrated provincial renewable energy programmes in Thailand*. Secondary objectives included ensuring that the project assists the province (MHS) in achieving 100% energy self-sufficiency, and facilitated a significant reduction in greenhouse gas (GHG) emissions through the development and application of renewable energy technologies.

2.3 PROBLEMS THAT THE PROJECT SOUGHT TO ADDRESS

STATED CONTEXT AND PROBLEMS THAT THE PROJECT ORIGINALLY SOUGHT TO ADDRESS

The original MHS-RE project design stated that the problem that the project was seeking to address was that the Thailand government's commitment to Renewable Energy and its national RE targets were not being translated into suitable real action in Mae Hong Son Province (and the neighboring provinces of Chiang Mai, Chiang Rai and Tak) – and that this was primarily through a lack of integrated provincial and local governmental planning policies. The original project design also stated that various new approaches, concepts and policies would be developed and applied, e.g. new ownership models for RE systems, improvements to tariff systems and loan management to be endorsed by the government and applied elsewhere in Thailand. Furthermore, information on existing incentives/policies for RE promotion, which were available but were sometimes seldom used, would be disseminated and promoted.

The Thailand government had operated a number of national programs to encourage larger RE projects, including the 1992 Small Power Producer (SPP) laws allowing grid-interconnection and the sale of electricity by the private sector. The SPP program primarily supported biomass projects of which the majority (34 out of 66 projects in 2007) used bagasse waste from sugar mills. As of May 2007, more than 1.16 Gigawatts (GW) of installed renewable energy capacity had been built under

the SPP program[7], and a further 370MW was awaiting approval. This compares with Thailand's total peak load in 2006 of just over 21GW.

In May 2002, Thailand was the first developing country to adopt net metering regulations (known in Thailand as the Very Small Power Producer (VSPP) program) that facilitated interconnection of renewable energy generators up to 1MW. Under these regulations, generators could offset their own consumption at retail rates. If a net surplus of electricity was generated, the VSPP regulations stipulated that Thai distribution utilities must purchase this electricity at the same tariff as the distribution utilities purchased electricity from EGAT. This was typically about 80% of the retail rate. Generators received higher tariffs during peak times.

As of March 2007, 98 generators had received notification of acceptance under the "1 MW VSPP regulations", with a total of 17.8 MW generating capacity. Compared with SPP generators, the VSPP programme involved a much wider range of fuels from solar photovoltaic (PV) (66 installations) through biogas (16 installations) to various types of biomass (total of 15 installations).

In December 2006, the VSPP regulations were further expanded to provide similar terms for renewable energy projects of up to 10MW per installation. As of April 2007, 43 projects with installed generating capacity of 364 MW had submitted applications for the "10 MW VSPP regulations" (PEA 2007).

By 2007, when the original MHS-RE project's rationale was finalised, MHS had four operational off-grid hydro power plants where DEDE had provided the machinery and equipment, as well as technical support, the villagers had provided labor for construction and some construction materials, and local government subsidised ongoing maintenance costs. The plants were operated by local village cooperatives. However, around half of the off grid hydros in Northern Thailand failed due to a lack of involvement by communities, improper maintenance, and difficulties in transferring government assets to private or communal ownership. So this approach was not working very well.

In addition, around 14,800 Solar Home System (SHS) of 120 W_p peak capacity were distributed to households in the off-grid areas in Mae Hong Son. These SHS were designed to supply enough electricity for several 20W light bulbs as well as a 14-inch TV set (50 W), a motorized sewing machine (75 W), a water pump (100 W) or a radio (15 W). The SHS including installation were provided free of charge to households. However, the French Development Agency (AFD) assessed in 2007 that as

[7] Of which 585 MW was sold to the grid, with the remainder providing electricity directly to factories

many as 80% of the 300,000 solar kits installed in the entire country might have already broken down[8].

Prior to the SHS scheme, village battery charging stations were provided by DEDE under the Renewable Energy for Rural Village Project. These stations were a common utility of each village. But due to improper utilization and maintenance, most of the installed units failed and the Ministry of Interior opted for the Solar Home Systems instead.

It should be noted that there were 14 villages, or approximately 500 households, in Mae Hong Son that are still un-electrified in 2007, when the MHS-RE project design was formulated. These 14 villages were all located in the designated 1A forest area where private land use had been prohibited since 1989 – the land was instead designated for conservation purposes. Use of water resources for electricity generation was prohibited, and although PV systems could be used, the villages were supposed to be unable to benefit from government programmes because, strictly speaking, the villages were illegal as they were located within protected forest areas. So this prohibition of off-grid villages using local hydro resources for electrification in designated 1A forest areas was a fact that was known in 2007. The electrification of off-grid villages using local hydro resources in designated 1A forest areas was not given a risk rating in the MHS-RE project design approved in 2010 (i.e. the risk was assumed to be insignificant). This risk was given more prominence and given a medium-low risk rating in the Addendum to the Project Design formulated and approved in 2014.

In the 1st phase of the project covered by the ProDoc design, most of the GHG impact was to be achieved by 20 on-grid hydros, most of which were also located in designated 1A forest areas. This fact was also stated in the ProDoc, but was not given a risk rating in the MHS-RE project design approved in 2010 (i.e. the risk was assumed to be insignificant).

The key applicable targets for the original MHS-RE projects design regarding Thailand's electricity generation from renewable energy sources were laid down in the Renewable Energy Development Plan (REDP) in 2009, which set a target[9] of 20% of renewable energy for 2022. Also in 2009, the Ministry of Energy designated Mae Hong Song (MHS) Province (the then poorest Province) to become the first energy self-sufficient Province (of 76 Provinces) in Thailand.

[8] Source: French Development Agency AFD, Thailand Mission Report August 2007, Rouland Louvel.

[9] This was revised in December 2011 and a new, much more ambitious target of 25% of renewable energy in 2021 was set in the new Alternative Energy Development Plan (AEDP). In July 2013 the AEDP was updated and even more ambitious targets were set.

In addition to the MHS-RE projects design being to assist MHS to become the first energy self-sufficient Province in Thailand, the MHS-RE project was also originally designed to work in MHS' neighboring three provinces of Chiang Mai, Chiang Rai and Tak, as they were stated to have comparable geographic and economic situations and RE potentials to MHS Province. By including these three extra provinces, a critical mass was to be created to leverage a comprehensive change in national policies and governmental planning processes regarding RE development and utilization in Thailand's rural areas.

RESULTS EXPECTED

According to the ProDoc's barrier analysis and project rationale, the expected project results linked to the MHS-RE's four outcomes were:

1. Strengthened institutional, organisation and social capacity results in planning, management and implementation of integrated RE programmes in MHS, Chiang Rai, Chiang Mai and Tak Provinces

2. Financially sustainable RE systems operational in MHS, Chiang Rai, Chiang Mai and Tak Provinces

3. Technical support is locally available for the development, management and maintenance of RE applications in MHS, Chiang Rai, Chiang Mai and Tak Provinces

4. Policies facilitate up-scaling and replication of RE systems in rural Thailand

The results expected in the ProDoc by the End-Of-Project (EOP) were an installed RE capacity of up to 11.8 MW from 20 new demo hydro power plants and one biomass residue / wood chip 1 MW plant. The demo power plants were to be mainly located in MHS Province, but also included 2 new hydros in Chiang Mai Province and one new hydro in Tak Provinces. The mix of on-grid and off grid RE electricity generation demos were to then lead to direct GHG Emission Reductions (over the lifetime of the investments of 20 years) of 702,616 (tCO2e), representing an RE investment of THB 800,000,000[10]. The 21 RE demos were to be funded and installed by other Thai government agencies (PEA and DEDE) and to start operating from 2010 to 2015, with the MHS-RE project claiming 100% of the projected 20-year GHG emission savings from the MHS-RE project's RE policy support - on the basis that the project's capacity building activities meant that the hydros that would be built would not have occurred without the MHS-RE project's RE policy support.

MID TERM REVIEW AND STRATEGIC REVIEW

A Mid Term Review (MTR) was undertaken in 2013, which found major problems in many aspects of

[10] Ref Table 19, MHS-RE ProDoc

the project implementation in its 1st Stage's 33 months of implementation to that point. As recommended by the MTR, a comprehensive strategic review was then undertaken and the project was re-scoped, with significant changes made to its framework, scope and focus. There was also a move in the 2nd phase of the MHS-RE project to Direct Implementation Modality (DIM) by UNDP, which replaced the National Implementation Modality by the Thailand Environment Institute (TEI) NGO.

There were therefore effectively two related but actually quite different phases of the MHS-RE project, namely the initial 1st phase MHS-RE project as implemented by TEI from 2010 to 2013, and the 2nd phase MHS-RE project as implemented directly by UNDP under DIM from 2014 to 2017. The key changes made to the MHS-RE project in its 2nd phase starting May 2014 were: (1) the refocusing of the project from primarily on-grid RE to off grid RE; and (2) the change from a 1st stage overall indirect approach of the enhanced uptake of RE through operationalising national RE Policies at the provincial, District and Sub-District levels to a 2nd stage RE technology focused approach. The new 2nd phase MHS-RE project approach shifted to primarily off-grid RE technology applications supported by physical demonstrations; an adjustment of approach to be specific RE technology focused rather than on wider financial mechanisms and market awareness, and reducing the project's implementation focus to just cover MHS province.

RE-STATED CONTEXT AND PROBLEMS THAT THE PROJECT SOUGHT TO ADDRESS IN 2ND PHASE

The restated context in the 'Addendum to the ProDoc' of 2014 to the reformulated MHS-RE project's context and the problems to be solved in the 2nd phase of the project was partly an updated version of that in the original ProDoc. The key stated general context in the Addendum to the ProDoc of 2014 was: (1) That the project should be focused on Mae Hong Son Province as it was identified (by the Ministry of Energy in 2009) as its target to be the first energy self-sufficient province in Thailand, in conformity with the king's sufficiency economy concept; (2) Efficient coordination between different levels of government (central, provincial, community) as well as in between government institutions involved in RE planning and implementation (DEDE, EGAT, PEA, etc) were lacking.

The new more specific context was: (1) A cooperative ownership model was promising for micro-hydropower which used water flows that are community resources; (2) Project interventions concerning hydropower needed to be very specific and focused, aimed at overcoming the legal barrier for realization of community based off-grid micro- and mini- hydropower plants; and (3) in addition to off-grid micro hydropower, the reformulated MHS-RE project was also to focus on on-grid solar, SHS rehabilitation and solar lanterns, Improved Cook Stoves(ICS), Biodigesters, integrated RE planning at the MHS Provincial levels, and rooftop solar and EE measures in government buildings.

The reformulated MHS-RE projects lessons learned in MHS were to be shared through: (1) the integration of RE programmes and activities into the strategies of nearby upper north clustered provinces of Chiang Mai, Lamphun and Lampang; (2) RE demonstration sites and learning centers in MHS; and (3) dissemination of knowledge and lessons learnt to relevant ministries, line agencies, private sectors, CSOs and the general public[11]. The 2nd phase MHS-RE project was to focus on establishing models and procedures, which could be followed by others [12]

So the context and problem to be solved in the 2nd phase of the MHS-RE project was still to give effect to the government's RE objectives, but now for this to be primarily achieved via RE technology demonstrations in off-grid RE applications in MHS, rather than the on-grid predominantly micro hydropower of the 1st phase of the MHS-RE project. But critically: (1) the legal challenges to building micro-hydro power in protected forestry areas was even more explicitly recognised; and (2) although there was a more direct emphasis of the 2nd stage of the project assisting tangible (esp. off-grid micro hydropower demonstrations), the mass replication of demo results was still assumed to be primarily through enhanced policy effectiveness and knowledge dissemination of the demos, not through direct support of mass replications based on the demos.

RE-STATED RESULTS EXPECTED IN 2ND PHASE

From the barrier analysis and project revised rationale of both the Mid Term Review (MTR) and of the Strategic Review, the original ProDoc's expected project results linked to the MHS-RE's four outcomes (components) were modified in the Addendum to the ProDoc to only apply to MHS Province, as follows:

1) Strengthened institutional, organisation and social capacity results in planning, management and implementation of integrated RE programmes in MHS

2) Financially sustainable RE systems operational in MHS

3) Technical support is locally available for the development, management and maintenance of RE applications in MHS

4) Policies facilitate up-scaling and replication of RE systems in Thailand

The MTR recommended that the project activities should be more focused around certain

[11] Para 39, p14 of approved Addendum to MHS-RE ProDoc

[12] Para 168, p40 of approved Addendum to MHS-Re ProDoc

technologies. This recommendation was taken over and included in the Addendum to the ProDoc. Some of the outputs formulated in the original document were merged, based on the recommendations of the MTR and because of budgetary reasons[13].

At the end of the second phase of the project, the following were the expected outcomes on the ground[14]:

- 1 on-grid solar farm project approved, installed and operational (500 kW);
- 100 SHS rehabilitated (100*120 Wp);
- 200 solar lanterns sold (200*2.5W);
- 20 additional biodigesters at schools, SMEs and farms installed and operational;
- 2 off-grid hydropower plants approved, installed and operational (2 * 30 kW);
- 10 solar rooftop systems approved, installed and operational (10 * 200 W);
- 1 EE project in government building approved, implemented and operational (RE capacity 600 W savings);
- 10 villages in which ICS have been tried out and were being used in MHS by end of 2016 (total 50 ICS systems).

Direct reduction of GHG emissions due to operation of these systems was expected to be about 14,216 tonnes of CO_2.

2.3 IMMEDIATE AND DEVELOPMENT OBJECTIVES OF THE PROJECT

The Project Objective was to overcome barriers to the provision of Renewable Energy (RE) services in integrated provincial renewable energy programmes in Thailand. The project was designed to contribute to the broader Goal of reducing GHG emissions in Thailand. Importantly, it was also designed to contribute to the Goal of Thailand's GEF strategy, which was to mobilize GEF resources in support of the implementation of Sufficiency Economy principles, as enshrined in the 10th National Economic and Social Development Plan.

[13] Para 137 and 138, MHS-RE Strategic Review, 2014

[14] Para 168, MHS-RE Strategic Review, 2014

2.4 BASELINE INDICATORS

IN THE PRODOC

The baseline situation stated in the ProDoc that only 228 villages (55% of villages) had access to Thailand's national grid via a 430 km long 22 kV line from Chiang Mai Province, with a 115 kV line being under construction with completion expected during 2010. For the 173 villages (42%) off-grid villages, since 2005 the Provincial Energy Authority (PEA) had distributed around 14,800 SHS photovoltaic systems in MHS, each of 120 W_p capacity, which would supply enough electricity for several 20W light bulbs as well as a 14-inch TV set (50 W), a motorized sewing machine (75 W), a water pump (100 W) or a radio (15 W). It was noted that many of the SHS were no longer operational, due to poor installation and technical deficiencies, and in particular due to the high cost of replacement parts for the SHS compared to rural MHS incomes.

In the ProDoc it was stated that over 65% of the MHS population still used wood as their primary cooking fuel.

IN THE ADDENDUM TO THE PRODOC

The baseline grid connection / access to electricity situation stated in the Addendum to the ProDoc was that there were around 26,000 - 30,000 households in MHS that were not connected to the grid and would likely never be connected due to a combination of distance from the grid, remoteness and terrain, and households being located in protected forest areas where grid extension would be difficult or impossible to get permission for. It was argued that off-grid electricity solutions were therefore required to electrify all households in Mae Hong Son Province. In the baseline, it was argued that government agencies had only limited plans to connect off-grid households to the grid in MHS. It was argued that there were no other concrete plans to provide off-grid solutions (such as additional SHS or solar lanterns) to households in MHS. In addition, given the challenges to the realization of off-grid hydropower plants, it was argued that the baseline situation was that it would be unlikely that any new off-grid mini- or micro-hydropower plant would be realized in the foreseeable future. Further, it was argued that more of the existing SHS which had been distributed in 2004/2005 would stop functioning, as the equipment was getting older. On average from 2005 till 2014, it was estimated that around 1,250 SHS systems stopped working each year in MHS (from the systems distributed in 2004/2005). Based on this, the baseline grid connection and baseline electrification scenario was that access to the grid would hardly increase in the foreseeable future, while the actual electrification rate would go down due to steadily increasing numbers of SHS which would stop functioning. Given the high number of households without access to the grid or electricity, it was felt that the project should work on increasing access to electricity in the province (MHS). RE technologies, which were seen to suit this MHS electrification purpose, included off-grid micro-hydro, and the rehabilitation of existing SHS and solar lanterns.

In the cooking fuels (ICS and biogas) baseline in the Addendum to the ProDoc of 2014, it was noted that more than 65% of the households in MHS use firewood for cooking. Given the importance of forests in the region and the annual haze problems from forest burning, it was seen as important to ensure that biomass sources were used as efficiently as possible and that forests were protected. It was argued that the project should therefore look at technologies such as biodigesters (for households, farms and schools) and improved cookstoves. It was noted that the livestock department of MHS was planning to support a project of Princess Sirinthorn to support schools in remote/difficult to access areas and to provide them with biodigesters to generate biogas for cooking. With the then currently available resources from the government in MHS, around 25 biodigesters were to be installed at schools.

2.5 MAIN STAKEHOLDERS

The key project stakeholders in the ProDoc included 11 governmental agencies and the Community Business Organisation. By the 2nd stage of the project the key stakeholders in the Addendum to the ProDoc were listed as a more manageable 6 governmental organisations and one NGO, as follows:

1) MHS Provincial Governor (Office) under the Ministry of the Interior, which was the signatory of the ProDoc on behalf of the Royal Thai government and which co-chaired the MHS-RE Project Board (with UNDP), and which is responsible for district and local government administration and budgetary support funding.
2) MHS Provincial Administrative Organisation (MHS-PAO) is another layer of local government, comprising an elected provincial council.
3) MHS Provincial Energy Office (MHS-PEO) under the Ministry of Energy, which is responsible for provincial energy development strategy plan for MHS and general support of RE in MHS and formerly funded around 15,000 SHS in MHS;
4) DEDE (Department of Alternative Energy Development and Efficiency) under the Ministry of Energy, which is responsible for funding and technical support for RE pilots across Thailand;
5) EPPO (Energy Policy and Planning Office of the Ministry of Energy) that focuses on recommending and setting energy policies, measures and plans;
6) MONRE (Ministry of Natural Resources and Environment) which (via DNP) is responsible for providing permission for activities in the natural / protected areas which account for 80% of MHS;
7) BGET (Border Green Energy Team), which is an NGO that provides hands-on appropriate technology training and financial support to village innovators in ethnic minority areas on both sides of the Thai/Burma border. BGET supports SHS and has established a commercial arm called SunSawang that focuses on SHS and solar lanterns.

In the 2nd stage of the MHS-RE project the EforE (Energy for Environment) Foundation became involved in the project's implementation and later secured $2.7 million of Thailand Energy Conservation Fund money to start a successor project to the MHS-RE project starting 01 October

2017.

3. FINDINGS

3.1 PROJECT DESIGN / FORMULATION

The overall rating for the MHS-RE project's design and formulation is Moderately Satisfactory (MS), covering unsatisfactory in the 1st stage and satisfactory in the 2nd stage of the project.

The original MHS-RE project design, as detailed in the signed ProDoc of 2010 (and reflecting an MHS situation of 2007 when most of the ProDoc was finalised), was a very generic approach to foster RE in North-West Thailand, primarily through supporting the translation of national RE policies and targets to integrated planning at provincial, district, and sub-district plans, plus information provision and training. The original project scope was clearly too ambitious, as it covered four provinces in Northwest Thailand with less than $3 million of GEF funding. The original project design was stated to support new pilot power stations (20 hydros and one biomass), the rehabilitation of existing Solar Home Systems (SHS) that were no longer functional (as their users, who had received them for free, had not replaced critical components such as charge controllers and/or batteries), and also non-electrical renewable energies like biodiesel and improved charcoal kilns.

The key original MHS-RE project design's linkage to its expected GHG emissions was RE policy support and policy integration, and then claiming that 100% of the GHG reductions from the 21 pilots of off-grid and on-grid power plants, that were already in the pipeline to be built in Mae Hong Son and nearby provinces, was due to the MHS-RE project's activities. This original MHS-RE project's claiming 100% of the GHG reductions of the proposed 21 pilot projects was clearly not really justifiable, even if the 21 projects had even been able to be built. The original MHS-RE project design was only going to apply GEF funding to support on-grid electricity generation systems, presumably as this would allow the GHG emission savings of displaced grid-electricity to be claimed. The replication approach in the original MHS-RE project design was to support the 21 pilots, and then assume that through the new integrated RE policy environment that the replications would occur spontaneously.

The original project design was to build on the existing efforts/ pipeline plans of DEDE and PEA to build on grid hydros in MHS, and to add incremental value to these existing efforts[15]. The original

[15] However, it was noted in the original ProDoc) that, strictly speaking, DNP were not supposed to give permission to build the proposed 20 hydro power plants in the protected areas of National Parks in MHS, which was where the hydros were to be built.

MHS RE project's design was to provide additionality by building the missing technical skills, management skills for O&M, as well as organising group and/or cooperative sustainable ownership.

Given that no (zero) hydros were built as a result of the 1st stage project design / formulation's RE policy support, and that there were no tangible outcomes from the 1st stage project's general policy support, the 1st stage of the project is rated as unsatisfactory in regard to its design / formulation.

The original and reformulated MHS-RE project designs noted but then essentially ignored the implications of a steady spread of grid coverage in MHS, and increasing 115kV transmission line supply and redundancy provision (the 3rd 115kV transmission line into MHS is now under construction, and at the design phase there was a 115kV transmission lines under construction into MHS. The actual grid-based electricity supply into the MHS province and within the MHS province has steadily improved since the project formulation in 2007, and, contrary to the claims in the original and reformulated MHS-RE project designs this expansion of grid coverage and reliability was completely foreseeable and predictable, it has happened elsewhere in Thailand and therefore it was logical that it would occur in MHS too.

The reformulated Addendum to the ProDoc of 2014 had a much improved design / formulation. It identified the large numbers of existing SHS in MHS that were steadily falling into disuse and that a program of rehabilitation should be started, that biogas units were being installed already and that useful project support could be provided in the biogas area, and that support for improved cooking was indicated for the 65% of MHS households that used firewood for cooking, and that on grid hydros should be abandoned. It was far more specific and technology-application focused. The 2nd stage design had more realistic targets for hydros, and usefully switched its hydro focus to off grid applications. The challenges to building hydros in protected forestry areas were more explicitly stated and were assigned a formal risk rating. So the design / formulation of the 2nd stage of the MHS-RE project was overall satisfactory.

Neither the original nor the reformulated MHS-RE project designs mentioned that the rural villages in MHS get visited regularly by pickup truck buyers/sellers, that rural villages already usually have a small general store that could therefore sell RE equipment such as solar lanterns and Improved Cook Stoves brought to the village by the existing merchants in their pickups.

ANALYSIS OF LFA/RESULTS FRAMEWORK

The overall rating for the MHS-RE project's LFA / Results Framework, is Moderately Satisfactory (MS), covering unsatisfactory in the 1st stage and satisfactory in the 2nd stage of the project.

The original MHS-RE project LFA Component/Outcome targets were more or less realistic in principle at the general component / outcome level. For component / outcome 1 the target was for 15 communities or entrepreneurs/local businesses to be operating another RE model than the

government BOO (Build Own Operate) model, with 10 more in the planning stage supported by the project. The Component 2 target was "that by the end of the project at least an additional 800 million baht would be invested in RE systems in MHS compared to the baseline. The Component 3 target was for the failure rate of rehabilitated SHS to be below 10%, and that for newly installed micro-hydro and biomass units' failure rates to be a highly optimistic 0%. The component 4 target was that at least 3 provinces had initiated plans to promote RE based on lessons learned through the project and undertaken feasibility studies for RE investments.

However, the activity-based targets under each component/outcome were generally very vague, and were generally unrealistic in the cases where there were SMART[16] RE targets. For example that by the end of the project, at least 95% of all off-grid households would have access to RE electrical energy; that the percentage of non-operational SHS units is less than 10%, and that by the end of the project there would be at least 12 more local RE manufacturers. Overall, the original ProDoc's LFA / Results Framework is rated as unsatisfactory

In the reformulated project, the LFA / Results Framework, the targets were far more realistic and were suitably SMART, and hence were evaluated as satisfactory. The detailed reformulated project LFA / Results Framework can be seen in the table in Section 3.3.1.

ASSUMPTIONS AND RISKS

The assumptions in the original MHS-RE project document were essentially that there would be full national, sub-national, provincial, district, institutional, local champion, local community, entrepreneur, educational and training institution, and individual stakeholder support for the project's ambitious RE policy interventions in MHS and their upscaling to cover all of Thailand. The summary of risk assessment and mitigation measures in the original project document was very general and was that all risks were low (with the exception of political instability and institutional uncertainty being rated low-moderate) and that mitigating actions were available to cover all risks, based on formal RE targets applying to all aspects of government at all levels, that the project board structure would be able to overcome all local barriers, and that the NIM NGO (TEI) will be motivated and able to overcome all the barriers that they face.

Many of the key assumptions stated in the original MHS-RE project LFA were unrealistic. Examples include:

- "Past experience of failure has not prejudiced communities against RE, especially solar systems"

[16] Specific, Measurable, Achievable, Realistic and Time bound.

- Output 2.3
- "No legal or institutional barriers affect feasibility (e.g. access to water resources)" – Output 2.4[17]
- "Tariff rates and other mechanisms are negotiable and the national government and state enterprises support the use of small-scale RE technology within the national energy programme" – Outcome 4
- Government agencies are willing to negotiate modifications to subsidy schemes to favor community generation of grid-linked RE – Outcome 4.3

The assumptions in the Addendum to the ProDoc of 2014 were essentially that there would be continued government support, funding and capacity for RE, along with continued community support and capacity or RE. These assumptions were ambitious given that when they were being developed there was a military coup underway in Thailand, and given that there are always different silos in governments between policies and actions that support economic development, environment protection and climate change mitigation. In addition, the opposition of DNP to the building hydros in protected forestry areas was explicitly stated and yet obtaining DNP permission to build new off-grid hydros was not was listed as an assumption.

The risk analysis in Annex IV in the Addendum to the ProDoc of 2014 was very much improved over that in the original ProDoc. The issues were more clearly and concisely identified, the issues were divided into different categories, risk levels were justified, and risk mitigation measures were spelled out in more detail and with dates attached. The challenges to building hydros in protected forestry areas were explicitly stated and countermeasures were provided to address the identified risks.

LESSONS FROM OTHER RELEVANT PROJECTS INCORPORATED INTO PROJECT DESIGN

The original MHS-RE Project Background in its Incremental Cost Analysis noted some critical lessons that could be learned from previous relevant projects "For example, the Department of Alternative Energy Development and Efficiency (DEDE) has established 59 micro- hydro projects with a total capacity of 2 MW in Northern Thailand since 1979, but by the end of 2003, only 25 sites are still operational…. And…out of around 300,000 solar home systems for rural electrification which have been installed in Thailand, approximately only 20% are still operating". But the issues may have been noted, but the lessons to be learned that micro hydros were of questionable sustainability once the grid reached their sites, and that the SHS supplied were too costly to maintain for most recipients, were then essentially ignored in the project's design and implementation.

The original MHS-RE project design then assumed that project-facilitated community ownership, a more coherent integration of national RE policy with Provincial, District and Sub-District plans, and RE training and awareness would remove the barriers that had been encountered in previous

[17] This assumption is not in line with text in the body of the ProDoc that states otherwise

projects, while using essentially the same RE technologies such as large capacity SHS and on and off grid small and micro hydros as had proven to be unsustainable in previous projects. The barriers were seen to be a consequence of the business model that was used at the time (100% grant without local ownership or an O&M sustainable operation model). The original MHS-RE project design tried to address these barriers by means of a different business model of the community ownership and O&M training as well as a different financing approach.

PLANNED STAKEHOLDER PARTICIPATION

The original and reformulated MHS-RE project designs seemed to identify most of the necessary key stakeholders. However, the level and degree of participation expected from many of the stakeholders was unrealistic. Neither the original or reformulated ProDocs mentioned the generally high level of governor turnover in MHS as MHS was a backwater where governors were often sent for short periods before they were reassigned to more prestigious provinces of posts or before they retired, and the fact that the views of MHS governors would carry little weight with DNP in Bangkok in the approval all of hydro power plants in protected forestry areas. It is not clear how much stakeholders were involved in the original MHS-RE project formulation that seems to have mostly been completed in 2007, or how much and how meaningfully stakeholders were involved in the 1st stage of the MHS-RE project. However, in the strategic review following the MTR and in the development of the Addendum to the ProDoc the Strategic Committee Serving as the Project Board and the following seven (7) Project Board minutes detail a suitable level of stakeholder participation.

REPLICATION APPROACH

The original MHS-RE 1st stage project design assumed that pilot projects that were mostly already planned and that would be funded by other agencies, combined with improved RE policy integration, and RE training and awareness would lead to replications. The reformulated MHS-RE 2nd stage project moved the focus on GHG mitigation impacts from indirect on-grid pilots to project directly supported off-grid pilots. However, both MHS-RE project stages implicitly assumed that replications would occur spontaneously, and would not need to be assisted by an explicit project-supported replication approach. In reality, the project could have achieved a far greater impact if an explicit project-supported replication approach had been included in the project design and results sought.

UNDP COMPARATIVE ADVANTAGE

UNDP was a good choice for proponent, IA and also for EA for the 2nd stage of the MHS-RE project. UNDP has long-standing and appropriate expertise in RE projects and has a suitably stable management structure for a project like the MHS-RE project that spanned ten years from its inception in 2007 to its final implementation in December 2017. UNDP also has a suitably strong

policy focus, a strong track record of conceiving and managing renewable energy projects, and a strong focus on creating local and sustainable capacities.

LINKAGES BETWEEN PROJECT AND OTHER INTERVENTIONS WITHIN THE SECTOR

There were no noticeable linkages between the MHS-RE project and other interventions within the sector, but it is not clear if any such linkages would have significantly impacts on the MHS-RE projects results.

MANAGEMENT ARRANGEMENTS

The MHS-RE projects original 1st stage and reformulated 2nd stage management arrangements were generally appropriate. The TEI NGO NIM implementation in the 1st stage could have worked if a more suitable NGO than TEI had been chosen, but TEI appears to have been an appropriate on paper, and NIM is an appropriate and desired implementation modality for UNDP-GEF projects. The DIM implementation modality used successfully in the 2nd stage by UNDP has its own risks, in particular that UNDP's bureaucratic processes are not really aligned with the speed and flexibility required to implement a complex, remotely located, and multi-faceted project such as the MHS-RE project.

The Project Management Unit (PMU) established by TEI in the 1st stage of the MHS-RE project was not very effective, due to high staff turnover in MHS (apparently partly due to TEI not being prepared to pay a high enough rate to get motivated and qualified enough staff prepared to live in the relatively isolated MHS town[18]), high overhead costs by TEI in Bangkok, and an over-emphasis on networking and training (particular strengths of TEI) and an under-emphasis on delivering tangible RE-application pilot projects.

In the 2nd stage of the MHS-RE project, UNDP as the IA promptly hired a suitably pro-active and energetic Project Manager with prior experience of working in MHS and who was prepared to stay in MHS for the three years (originally this was to be two years) remaining for the project's implementation. The DIM approach used by UNDP in the 2nd stage of the project apparently presented some challenges in timeliness of procurement and other issues, but the end result was that what needed to be done got done, and the project has achieved good results and successfully and effectively utilised its remaining budget provision, and closely as planned by component.

3.2 PROJECT IMPLEMENTATION

[18] Mae Hong Son is 883 km north of Bangkok and 251 km north-west of Chiang Mai.

The Thailand Environment Institute (TEI) implemented phase 1 of the MHS-RE project under the NGO Implementation Modality (NIM). A mid term review was completed in August 2013 that, amongst other matters, recommended the urgent undertaking of a strategic review, which was completed in June 2014. This strategic review effectively set a new strategy and framework for the 2nd phase of the MHS-RE project. The new phase 2 was implemented under Direct Implementation Modality (DIM) by UNDP. The reformulated Phase 2 activities and indicators are now those that the MHS-RE project terminal evaluation is judging the project results against.

ADAPTIVE MANAGEMENT CHANGES TO THE PROJECT DESIGN AND PROJECT OUTPUTS DURING IMPLEMENTATION

The key adaptive management changes made during the MHS-RE project's implementation included: (1) scaling down the initial over-ambitious target indicators in the 1st phase to a more realistic set of indicators in the 2nd phase; (2) an implementation modality shift from NIM to DIM; (3) shifting the primary project focus from on-grid RE to off-grid RE; (4) reducing the project target areas from four Provinces to just MHS Province; (5) moving the project day-to-day's implementation management responsibility from Bangkok to MHS; (6) focusing the RE policy aspects from an initial expansive and vague RE policy integration objective to a more specific objective of getting the MHS provincial development plan to integrate RE into MHS provincial and Sub-district Development Plans; and (7) utilising an existing regional NGO (Border Green Energy Team: BGET) who were active in the nearby province of Tak to support the installation of Solar Rooftop systems, Solar lanterns and Biodigesters. These changes in the project design and implementation of the 2nd phase of the project were sufficiently decisive and timely for the project to largely achieve its 2nd phase outputs/ outcomes.

The adaptive management shift to include Improved Cook Stoves (ICS) in the list of specific RE technologies to be covered in the 2nd phase of the MHS-RE project was a major contribution towards the overall satisfactory implementation of the MHS-RE project. ICS were found to have a real impact at village and household levels, since they are inexpensive, tangible, simple to use, and they address the needs of all of the 65% of MHS households who use cookstoves. The redesign of the 2nd phase of the MHS-RE project to specifically include ICS, and the successful adaptive management regarding ICS in the 2nd phase project implementation not only contributed to the success of the MHS-RE project in terms of the number of households reached, but also to the strong replication potential for the successor $2.7 million EforE project that is already underway in MHS. ICS contribute strongly to the quality of women and children's lives, they reduce by 30-50% the labor (primarily undertaken by women) needed for firewood collection, and at the same time ICS significantly and directly reduce firewood collection pressure on surrounded natural forests.

In the original MHS-RE project design and1st phase implementation, the SHS focus was the rehabilitation of the large capacity and expensive SHS RE installed under pre MHS-RE programs in 2004-05, of which only about 1/3 were still operational in 2014 when the Addendum to the ProDoc was prepared. A new more sustainable SHS rehabilitation business model was introduced to use the services of BGET, which already operated in the nearby Tak province. Another key innovation introduced in the Addendum to the ProDoc was to introduce the concept of lower cost solar lanterns as a lower cost alternative to the expensive to rehabilitate SHS that had been distributed in 2004-05. In the 2nd stage MHS-RE implementation, further useful adaptive management was undertaken to identify and introduce lower cost new SHS concepts to replace the expensive to rehabilitate and maintain large SHS that had been provided free of cost in 2004-05. This model of lower cost and more modern packaged SHS can now be expanded in the EforE MHS-RE successor project that is now already underway.

PARTNERSHIP ARRANGEMENTS WITH RELEVANT STAKEHOLDERS

The project strategy towards crowding-in from the general public (e.g. bridging the gap between the haves and have-nots for rural energy access) and by having the celebrity Ms. Thanyachanok Mooninta (Ex Miss Thailand World) under the umbrella of "Friend of UNDP" visit the MHS governor and villages in January 2017 created positive impacts for the MHS-RE project's image as well as for the MHS-RE project partners' commitment. The piloting of 10 solar rooftops at public buildings (e.g. SriSangWan Hospital, Sub-district health care centers, and schools were very appropriate initiatives. However, the project's solar panels were not at all a new technology or application. For example, at the Ban Nong Klang Khao Health Care Promotion Center, there were already 2 sets of solar panels installed by private donation and another one by the Thai government budget, and then the MHS-RE 2nd stage project provided a 3rd set of solar panels to the same facility. The high school beside this Health Care Promotion Center already also had a much larger capacity solar PV system that had been supported by an international donor. Therefore, during the project design and reformulating for the 2nd stage of the MHS-RE project, there was not seem to have been a suitable analysis on how installing a fully funded 3rd solar PV system to a remote hospital was somehow going to give a useful demonstration effect that was not already provided by the hospital's two existing solar PV systems or the larger solar system right next door at the school. It is not clear what the 2nd stage MHS-RE project fully funded 3rd solar system at the school was demonstrating that was new or that would get replicated.

It was clear to the TE that the capability of government officers and UNDP project staff on RE technologies was limited. For example, the project's MHS main counterpart – the MHS Provincial Energy Office (MHS-PEO) - had only 3 government officers whose responsible are on all aspects of

all energy types in MHS. It would unrealistic to expect that this MHS-PEO to serve as the main counterpart for RE in MHS province, even if the MHS-PEO had a team of enthusiastic and highly committed staff. Using RE market-based commercial suppliers and service providers in MHS could have been a better model for promoting RE in MHS. This is because they operating are in the real markets, knowing and accessing to diverse types and prices of RE devices, and hence adaptive to local needs that can be adjusted, and after-sale-services can be negotiated directly between suppliers and consumers.

FEEDBACK FROM M&E ACTIVITIES USED FOR ADAPTIVE MANAGEMENT

In the 2nd phase of the MHS-RE project, the project had adjusted targets at Outcomes and Outputs levels that were more achievable and better aligned to the changed political landscape in Thailand in 2014. The adaptive management focused adjusted Outcome and Output 2nd stage MHS-RE project changes were a result of the M&E undertaken as part of the project's MTR and the project's subsequent Strategic Review. These adaptive management changes allowed the project's implementation to be better focused in term of: a reduction in focus to just MHS province; a change from NIM to DIM operation; a tightened focus onto specific RE technologies and applications; and utilising available RE experts from Border Green, EforE, and the Royal Thai Army. Without such a refocus, the results of the project would not such tangible as has now been achieved. A number of Outputs (such as Output 4.1 (Transparent system of government accountability established) were deleted in the 2nd stage of the MH-RE project were deleted for the 2nd stage as M&E activities had identified that they were beyond reach of the project[19].

PROJECT FINANCE:

The MHS-RE project at 30 October during the TE field mission was expected to utilise 99.7% of its full budget by the project end of 31 December 2017. The total; project expenditure from 2011 to 2017 by component closely matched the original ProDoc budget per component. The project budget and the expenditure by component by year is detailed in Appendix F to this report.

EVALUATION: DESIGN AT ENTRY AND IMPLEMENTATION

The project design at entry was clearly based on a situation assessment of 2007,and minimally updated and hence significantly outdated by the time the ProDoc was signed by the governor of MHS Province in December 2010. The ProDoc design was very general; was overly ambitious in

[19] August 2017, Project Monitoring Report by Pattarawan Eamprasert

scope, outputs and expected impacts; and had a weak connection between the activities it was planning to implement and the results expected. The design of the project was significantly improved following the MTR completed in August 2013 and the Addendum to the ProDoc (essentially a new ProDoc) that was completed in June 2014. The Addendum to the ProDoc was considerably more SMART, and had a generally sound situation analysis and list of proposed interventions.

UNDP AND IMPLEMENTING PARTNER IMPLEMENTATION / EXECUTION

At the beneficiary level, the TE found that the stakeholders interviewed could only mentioned the name of the applicable expert (either from E4E or BGET) who were involved in particular relevant project interventions. They could know that these are GEF-UNDP project related people, but the project visibility on the ground could have been improved. The project logo, and the project's office name have been very limited in term of the MHS population. The MHS-RE project's ICS partners and the local EGAT's representatives that were interviewed by the TE team had only limited information on the MHS-RE project's overall interventions and goals. This should be improved in later projects to better achieve co-funding from other provincial partner e.g. tourism and temples, which could be the main hub for RE campaigns and communication plans in MHS.

3.3 PROJECT RESULTS AND RATINGS

Cumulative results (as of June 2017) at outcome indicator level were as follows:

Objective / Outcome: Description of Objective / Outcome	Description of Indicator	Baseline Level	Target Level at end of project	Cumulative results (as of 30 June 2017)
Project Objective: To overcome barriers to the provision of Renewable Energy (RE) services in integrated provincial renewable energy	Objective Indicator 1: Increase of power generation capacity and usage from RE systems in MHS both on-grid and off-grid	RE power generation capacity in MHS amounts to 29.2 MW (on grid) and 255 kW (off-grid). (June 2014)	Additional RE power generation capacity of 500 kW (solar farm) and 60 kW (off grid hydro) and several solar applications realized.	Cumulative additional RE power generation capacity - 20.78 kW (on-grid solar PV rooftop), - 5 kW (off-grid PV systems) - 20.52 kW (171 SHSs*120 Wp) - 0.31kW (95 solar lanterns*3.3 W) - 0.14kW (390 solar lanterns*0.35W)

Objective / Outcome: Description of Objective / Outcome	Description of Indicator	Baseline Level	Target Level at end of project	Cumulative results (as of 30 June 2017)
programmes in Thailand				20.78 kW *(*on-grid*)* and 25.97 kW *(*off-grid*)*
	Objective Indicator 2*:* Models for RE generation & application which can be replicated in other areas demonstrated	No of new models for RE generation & application.	At least 3 new models for RE generation & application developed and operational. Models ready to be replicated in other areas *(*hydro, solar and biodigesters*)*.	Cumulative results*:* total 7 models
Outcome 1*:* Strengthened institutional, organizational and social capacity results in planning, management and implementation of integrated RE programmes in MHS	***1)*** No. of RE projects proposed by government agencies in line with provincial plans	None	At least 2 RE projects proposed by government agencies in line with provincial plans	Cumulative results*:* Total 22 RE project proposals submitted throughout the project
	2) No. of working RE management models established	None	At least 3 management models established *(*off-grid hydro, biodigesters, solar*)*	Cumulative results*:* total of 7 models established.
Outcome 2*:* Financially sustainable RE systems operational in MHS	***3)*** No. of on-grid solar farm projects approved, installed and operational in MHS by end of 2016	3 *(*total 2,880 kW- June 2014*)*	1 additional on-grid solar farm project approved, installed and operational in MHS by end of 2016 *(*capacity 500 kW*)*.	No longer applicable indicator after the conclusion of Project Board meeting on 25 May 2016
	4) No. of SHS rehabilitated in MHS by end of 2016	0	100 SHS rehabilitated in MHS by end of 2016 *(*100*120 Wp*)*	Cumulative results, Altogether 171 SHS rehabilitated or 171*120 Wp = 20.52 kWp for the whole period of the project.

Objective / Outcome: Description of Objective / Outcome	Description of Indicator	Baseline Level	Target Level at end of project	Cumulative results (as of 30 June 2017)
	5) No. of solar lanterns sold in MHS by end of 2016	0	200 solar lanterns sold in MHS by end of 2016 *(*200*2.5W*)*	Cumulative results*:* Throughout the project, 485 solar lantern realized *(*sold*/* bartered*/* crowd funded*)* Altogether 313.5 + 39.2 + 97.3 = 450 W
	6) No. of biodigesters installed at schools, SMEs and farms in MHS by end of 2016 with	33 *(*at SMEs*/*HH – June 2014*)*	20 additional biodigesters at schools, SMEs and farms installed and operational in MHS by end of 2016 with support from project *(*average size 8 m3*)*	Already accomplished in 2016 Cumulative results*:*, 31 biodigesters size 8 m3 installed *(*10 in schools + 21 at households*)*
	7) No. of off-grid micro-hydropower projects approved, installed and operational in MHS by end of 2016	9 *(*255 kW – June 2014*)*	2 off-grid hydropower plants approved, installed and operational in MHS by end of 2016 *(*2 * 30 kW*)*	No longer applicable indicator after the conclusion of Project Board meeting on 25 May 2016
	8) No. of solar rooftop installations approved, installed and operational in MHS by end of 2016	0	10 solar rooftop systems approved, installed and operational in MHS by end of 2016 *(*with support from the project*) (*10 * 200 W*)*	Cumulative results 20.78 kWp installed at government and private buildings; power generation capacity = 29,757 kWh*/*year, electricity cost savings THB 148,785 Cumulative results*:* 3 EE projects implemented and operational in MHS throughout the project
	9) No. of EE projects in government buildings approved, implemented and operational in MHS by end of 2016	0	1 EE project in government building approved, implemented and operational in MHS by end of 2016 *(*RE	Cumulative results*:* 3 EE projects implemented and operational in MHS throughout the project

Objective / Outcome: Description of Objective / Outcome	Description of Indicator	Baseline Level	Target Level at end of project	Cumulative results (as of 30 June 2017)
			capacity 600 W savings*)*	
	10) No. of villages in which ICS have been tried out and are being used in MHS by end of 2016	0	10 villages in which ICS have been tried out and being used in MHS by end of 2016 *(*50 systems*)*	Cumulative results; altogether 42 villages of 3 ethnic groups with 415 units of ICS realized, being used
Outcome 3*:* Technical support is available locally for the development, management and maintenance of RE applications in MHS	***11)*** No. of village technicians trained to operate and maintain off-grid hydropower plants	No knowledge *(*center*)* or experts easily available	4 village technicians trained to operate and maintain off-grid hydropower plant by end of 2016	No longer applicable indicator after the conclusion of Project Board meeting on 25 May 2016
	12) No. of village technicians trained to maintain rehabilitated SHS	0	10 village technicians trained to maintain rehabilitated SHS by end of 2016	Cumulative result*:* - 10 village*/*TAO technicians trained - Total of 1,353 persons trained
	13) No. of technicians trained on EE measures and solar rooftop installation	0	2 government technicians trained on EE measures and solar rooftop installation	Cumulative result*:* 11 government & private technicians trained
	14) No. of users trained in the operation and maintenance of biodigesters	0	20 users of biodigesters trained to operate and maintain the systems	Cumulative results*:* 165 users trained and maintain the system
	15) An improved design of an ICS suitable for situation in MHS	None	Improved design for ICS suitable for MHS finalized	Cumulative results*:* Improved design for ICS suitable for MHS finalized and being used among 55 project volunteers.
	16) Documented and published experiences*/*lessons learned from all	None	By end of 2016 all lessons learned documented and published	Cumulative results*:* - 2 lessons learned on MHP & ICS completed & presented;

Objective / Outcome: Description of Objective / Outcome	Description of Indicator	Baseline Level	Target Level at end of project	Cumulative results (as of 30 June 2017)
	technologies implemented by end of 2016			- 1 ICS article published on UNDP website; - 1 video *(Thai)* on ICS operational mechanism completed - 7 lessons learned - RE curriculum for school tried-out
	17) Centre of learning approved and operational in MHS by end of 2016	None	Centre of learning approved and operational by end of 2016	Cumulative results*:* 2 RE learning centers at (1*)* Ban Pang Tong School and *(2)* the 17th Infantry Regiment Task Force
	18) Guidelines published	None	At least 2 guidelines for replication published e.g. *(a)* on management models for off-grid applications (b*)* incentive schemes*/*financial model for RE	Already accomplished in 2016 Cumulative results*:* 3 guidelines published & disseminated to concerned agencies & users
	19) No. of lessons learned included in policy making at central level	0	At least 2 important lessons learned included in policy making at central level	Cumulative results*:* 2 lessons learnt and study completed on towards MHS RE special development zone

3.3.1 OVERALL RESULTS (ATTAINMENT OF OBJECTIVES)

Rating #4 - Moderately Satisfactory (MS)

1. *Appropriate Improved Cook Stoves (ICS) Successfully Identified and Demonstrated* - the ICS introduced to MHS have the largest potential future RE impact in the medium term of any of the MHS-RE project interventions. However, the successor EforE project needs to make better use of existing (conventional) cook stove supply and transport chains. ICS costs will reduce with increased manufacturing scale, and increased manufacturing scale will follow increased demand. The key issues for ICs are actively pushing mass replications, and then by moving away from hand building ICS on crude machinery in cooperatives at a rate of 50 per month to increasing manufacturing capacity by 10-50 times in more organised industrial manufacturing facilities.
2. *Self-Use Grid Connected Solar is a Key Future RE Potential*. The MHS-RE project supported hospital, hotel and commercial building solar PV pilots that should all be sustainable, and with active replication support should lead to useful replications under the EforE project. However, mass replications of grid-connected solar PV needs formal grid interconnection protocols and proper professional technical installation guidelines for grid safety. There will also be a need formal and proper net metering or 2-way energy metering protocols for mass replication.
3. *External SHS Rehabilitation is Useful But Limited*. The Royal Thai Army and BGET (Border Green Environment Team) were successfully mobilised by the MHS-RE project to fix existing SHS, but the approach piloted needs ongoing external funding, and hence in the long term it is likely to be unsustainable. Some users are funding their own SHS O&M via local technicians, which is a more sustainable approach and should be pursued under the successor EforE project. User funded simpler and less costly packaged SHS provided via existing local electrical/satellite dish providers is already starting to happen without donor support (see photo of such a SHS at the front of this report). Continued reliance on donor SHS support risks undermining growing market demand and market provision of SHS into the future.
4. *Biogas Successfully Demonstrated but Limited.* Some biogas systems were successful piloted, but systematic biogas replication needs: sufficient user ownership; a sufficient and reliable pig/cow manure supply; a user need for the biogas at the digester; knowledge, use and valuation of the biodigester residue as fertiliser, and recognition that at most 10% of MHS households are appropriate and sustainable biogas users.
5. *Solar Lanterns Deployed*. However, it is not clear that 150-600 Baht solar lanterns are the appropriate off-grid lighting solution for most MHS households that already have a 10,000 Baht value motorcycle and can pay 150 Baht per 1-4 weeks for petrol for their motorcycle.

The off-grid lighting future may be 3000 baht (or less) already available Mini Packaged DC SHS with a radio, 2 USB ports, 3 LED lamps, and a credible one-year guarantee.

6. *School Curriculum Nearly Complete*. However, the information in the school curriculum is very generic, some of the information was clearly copied from other sources without any updating[20], and the RE information in the curriculum is not really applicable in the students own lives with its mentions of wind power (MHS has minimal usable wind resource), and nuclear power, tidal power, and geothermal power that are not at all applicable in MHS.
7. The four key RE technologies supported by the MHS-RE project in its 2nd phase are Improved Cook Stoves (ICS), rooftop solar PV, solar lanterns/SHS, and biodigesters,
   As detailed in the August 2017 Project Monitoring Report, and also corroborated from the TE evaluation's assessment, the 2nd phase MHS-RE project implemented from May 2014 has had significantly improved project management, a suitable national project ownership structure, and appropriate M&E (Monitoring and Evaluation) elements compared to the 1st phase of the MHS-RE project.
8. Barriers to the successful implementation of both phases of the MHS-RE project include high turnover of Project Management Unit (PMU) and governmental counterpart staff; challenges to project site access due to their remote locations in MHS' hilly country subject to high rainfall; and the socio-economic constraints of MHS being the poorest province in Thailand that is ranked lowest in terms of the human development index. Within this context, adoption of RE in MHS was always going to be a challenge. The MHS-RE project's proposed solar farm and micro-hydropower technologies activities in both phases of project implementation have not been successfully established by the project, due to policy and regulatory barriers, in spite of apparently strenuous project efforts.
9. The MHS-RE project is currently scheduled to finish in 2017, having been granted a one-year time extension in 2016.
10. It would appear that the MHS-RE project has met or exceeded its 2nd phase redesign's numerical targets for: training; new RE technical model demonstrations; Solar Home Systems (SHS) rehabilitation; sale of solar lanterns; number of villages with ICS, the development and use of improved ICS designs; the documentation and publication of lessons learned and guidelines; and the establishment of RE learning centers.
11. The on-grid solar farm and off grid hydropower objectives do not appear to have been achieved, nor to be achievable now. This means that the original and redesign target project

[20] E.g. Table 1.6 in the Curriculum shows the Pros and Cons of Renewable and Non-renewable Energy, and was downloaded from www.leonics.co.th without any modification to the objectives of the MHS-RE Project or especially for the needs of the Curriculum.. The points made were unclear and several contradict each other.

indicators of total RE kW installed have not been met, and will not be met by the MHS-RE project's end.

3.3.2 RELEVANCE (*)

Rating #2 – Relevant (R)

The MHS-RE project is highly relevant for Thailand, as it addresses both renewable energy targets and rural access to energy issues in Mae Hong son (MHS), one of the poorest of Thailand's 76 provinces.

The project was highly relevant for women and young people, as the labour of gathering firewood largely falls on them, and they benefit the most from the reduced smoke from the improved cook stoves (ICS) and from having lighting for studying in the evening from the renovated SHS and from the solar lanterns that were successfully demonstrated in MHS.

All seven of the RE technologies demonstrated in the 2nd Phase of the project are proven technologies that are highly relevant in MHS and in Thailand, and are very relevant for international 'sustainability for all' objectives.

The integration of Thailand's RE policies with Provincial, District and Sub-District policies is also relevant.

The support of Army and school based RE learning centers is very relevant.

The demonstration of ICS in MHS is particularly relevant, as around 65% of households still cook with firewood (and a small number with charcoal) so the replication potential with the demonstrated ICS with their 30-50% wood savings in highly relevant to reduce deforestation in MHS.

The on and off-grid mini and micro hydro power plants that were promoted throughout the project are highly relevant, even if they were not realised from the restrictions of their location in restricted areas in national parks.

3.3.3 EFFECTIVENESS (*)

Rating #4 - Moderately Satisfactory (MS)

The MHS-RE project made use of user co-financing for on-grid solar, SHS rehabilitation and biogas. However, the informal retail supplier financing-credit mechanisms that seems to be available for some households in rural villages (as used by merchants for gas stoves (see picture below) did not appear to be utilised.

Gas cooking stove supplied by merchant and paid by monthly 600 Baht payments over a year to a rural Karen minority household

The 20 new hydros that were the key source of the original ProDoc's large anticipated GHG emission savings were supported at a policy level by the project, but they do not appear to have been supported at a specific technical level by the project. Rather the MHS-RE project's policy interventions were supposed to make the hydro's viable, even although most of the multiple new hydros' designs, permitting and construction would have been well underway by the time the MHS-RE project's policy interventions were initiated. Claiming 100% of the GHG mitigation benefits of MHS-RE project policy interventions is logically questionable for hydro projects that were already physically well underway.

In the second phase of the project, the two new hydros were well supported by the project. However, the fact that new hydro power plants were, strictly speaking, not allowed to be built in restricted areas of national parks was known and was identified in both the original ProDoc and in the Addendum to the ProDoc (which was essentially a revised ProDoc). Providing electricity to the villages that were supposed to benefit from the new hydros was known and detailed in the Addendum to the ProDoc to be a questionable argument, as the villages to be electrified by the new MHS-RE project supported off-grid hydros were not supposed to be in the restricted areas of the national parks at all.

So the risk to gaining permission to build the hydros was identified and detailed, but this was then given a low risk rating in both phases of the project and for both on-grid and off-grid hydros. In reality, the MHS-RE projects support of on and off grid hydros in the two phases of the project was

a very high risk intervention approach, not a low risk intervention approach as stated in the Addendum to the ProDoc.

The terminal evaluation field mission found examples of existing supply chains for cook stove supply, solar lanterns, and SHS that were not utilised by the MHS-RE project (see picture below). The 3000 Baht solar packaged SHS that were already commercially for sale in MHS town is shown on this report's cover page, and they are being sold by an established store that has been selling satellite dishes for 10 years, when visited on the evaluation mission the shopkeeper exchanged components for other goods under guarantee on the spot with no questions asked so the SHS' one-year guarantee would be credible, the retailer had suitable technical support in place from the importer in Thailand, and the system provided what rural users had said they wanted from a SHS in MHS-RE project reports.

In another village, the school had a MHS-RE project supplied demonstration solar lantern, while about 50m away a small village store owner had a solar lantern that a friend had bought him at the market for 150 Baht that had worked for a year but the store owner was unaware of the demo solar lantern at the school and the school was unaware that the store owner had a successful solar lantern example to sell. In other words, supply chains already existed for the products that the MHS-RE was demonstrating nearby, but neither party knew of the existence of the other party.

Remaining stock from a truckload of around 300 standard cook stoves delivered to a MHS small town general store for around 30,000 Baht (covering both stove costs and transport costs) from Chiang Mai. Therefore, in the future, when stores order ICS by the truckload, suitable existing transport links can be utilised from Chiang Mai, or from other ICS manufacturing sources,

The MHS-RE project was supporting grid connected solar farms, but meantime EGAT had a 3MW solar farm under development with funding in place, land already purchased and earthworks already underway next to an existing 500 kW solar farm. However, the local community claimed that it had not been properly consulted, although this may not be the real reason for community opposition. The MHS-RE project was aware of this EGAT solar farm and its claimed lack of community support issue, but it was outside the mandate of the MHS-RE project to become officially involved. However, the successor EforE project should, if possible, support this extended EGAT solar farm (ns similar RE initiatives from other parties) with the critical value-added neutral community engagement support, which may be an area where EGAT lacks the necessary skills. This could give the EforE project a early 'win' of providing critical support to a new 3MW grid-connected solar farm.

In other examples of questionable effectiveness, the MHS-RE project deployed biogas demonstrations in applications where they were unlikely to work, e.g. providing biogas digesters in mountain area applications without enough pigs or for users without a real need for biogas at the biodigester site. Biodigesters have their place, but they need to be: carefully matched to a steady and sufficient manure supply; the users need to have a strong need next to the digester for the biogas; the users must have a need for the organic fertiliser produced as digester residue; and there must be sufficiently motivated, owners, users and operators of the digesters.

3.3.4 EFFICIENCY (*)

Rating #4 - Moderately Satisfactory (MS)

UNDP brought in a Direct Implementation (DI) approach in a timely manner when the 1st stage NGO Implementing Agency (IA) approach was observed (and documented) by UNDP to not be working very efficiently due to a scattergun non-strategic approach to project activities, excessive management costs, a high turnover of project staff in MHS, and these deficiencies were then corroborated in the mid term review. UNDP then hired a suitably motivated and pro-active Project Manager (PM) who was willing to work in MHS (and who has stayed in this role for nearly three years) and who was familiar with MHS, and also with UNDP systems. UNDP then initiated a high quality and timely strategic review, which developed the necessary strategic reorientation, development of a new LogFrame and slightly streamlined components (focusing on just MHS Province), a reordered and reoriented set of activities, and then efficiently implemented the new approach. The new project scope was reduced from three provinces to just cover MHS, which was far more realistic than the original scope. However, the project's efficiency was let down by delays in fielding the mid term review and in changing from NIM to DIM implementation modality.

The MHS-RE project efficiency was also undermined in its 2nd stage from 2014-2017 by the considerable project resources put into promoting off-grid hydros. It was known that this would be problematic as the hydros should not be given permission to be located installed in protected areas of national parks. It was also known that providing an electricity supply to villages that strictly speaking were not supposed to be in the national park area anyway would not be a very persuasive argument but this was relied on anyway to justify the effort that was put into the 2nd phase off-grid hydros.

3.3.7 SUSTAINABILITY

Rating # 4 – Likely (L)

Key MHS-RE project supported RE demonstration technology-applications are generally likely to be maintained by their users and replaced at the end of their life. The project supported Learning Centers are likely to continue in operation for the foreseeable future at schools and at the Army base

near MHS city. Beneficiaries' self-funding, supplier financing, CSR (Corporate Social Responsibility) funding, donation to hospitals being put into solar PV panels, crowd-funding public support for solar lanterns (and potentially for ICS and small packaged SHS) have now been proven for key RE technology-applications by the MHS-RE project. Along with a growing interest in 'Green' and RE issues, this means that key project supported interventions are likely to have a sustainable post-project replication take up. This post-project-end sustainability is likely to be assisted by the ongoing trend for Solar PV panels, batteries and ICS costs to reduce in the future from increasing economies of scale

The Energy for Environment Foundation (EforE) has already received 92 Million baht funding from Thailand Energy Conservation Fund for a 2.5 duration year project that started 01 Oct 2017. This EforE project explicitly builds on the UNDP-GEF MHS-RE projects results, so this is a tangible indication that the MHS-RE project's key initiatives are funded (sustainable) into the year 2020. The socio-economic situation in MHS is generally stable enough, and the institutional framework and governance arrangements established for the MHS-RE project should provide a good starting point for the EforE successor project. The environmental context for the EforE project should continue to be generally favorable, although the inability to build new hydros in the 80% of MHS that is designated as forestry / protected areas is likely to continue. This means that off-grid RE in MHS is likely to primarily be solar PV and ICS, and in some narrow niches could be biogas.

3.3.8 IMPACT

Rating #4 - Moderately Satisfactory (MS)

The MHS-RE project in itself has led to limited direct project interventions based impacts, compared with the extremely ambitious initial ProDoc based project's anticipated impacts from the 20 hydro power plants. The MHS-RE project in its original ProDoc as followed in Phase 1 was proposing to claim full credit for the 20 hydros GHG emission reduction due to the project's RE policy interventions, even although the funding was being provided by Thai government agencies and the hydros design (and in many case their construction too) would have been well underway by the time the MHS-RE project was approved by the Governor of MHS province on 23 December 2013. And this also ignores that the hydros would have mostly been built is protected areas in national parks where new hydro power plants were not supposed to be built, and this was know and is stated in the original ProDoc. The 2nd phase of the MHS-RE project had more realistic reset targets, but even then the bulk of the GHG emission reduction were going to come from two new off grid hydros, which again would face the same problem as the 1st phase of trying to build hydros in protected areas in national parks (and this problem was also known and stated in the addendum to the ProDoc – effectively the new ProDoc). So marking down the impact of the MHS-RE project for not achieving targets which were never realistic in both phases 1 (on grid hydros) and phase 2 (off-grid hydros) is not really fair. A mitigating factor in terms of evaluating the MHS-RE projects impact is that the ICS,

solar lanterns, and biogas units supported by the MHS-RE project will make a useful impact are likely to lead to a growing ongoing impact from to post-project-end replications, even although the project did not explicitly support replications from its demos.

3.3.9 M&E, IA, EA EXECUTION

M&E – Rating #5 - Satisfactory (S)

The MHS-RE project kept track of its activities in Stage 1 progress, but struggled to link these activities to results and impacts. This not very satisfactory M&E performance in stage 1 was an expressed area of concern in the mid term review. In stage 2, a generally very good M&E effort and results were achieved. So the project at its end has good records of what activities were undertaken, and how these activities relate to the original ProDoc's and updated ProDoc (the addendum to the ProDoc) results frameworks. However, on the terminal evaluation mission stakeholders seemed to be largely unaware of the MHS-RE project's M&E results.

IA - Rating #5 - Satisfactory (S)

The two Implementing Agencies (IAs) worked hard in both phases of the MHS-RE project to achieve the targets that had been set. However, in stage 1 under the TEI as IA, there was high PM and field staff turnover, high overheads, and a focus on general RE training and capacity building - which was one of 1st phase's IA's strengths, but there was a lack of focus on tangible RE implementation through demos that could be replicated. Risk management seems to have been poor, and there seems to have been poor responsiveness to implementation issues and a lack of candor and wishful thinking in project reporting.

Following the mid term review and the strategic review/realignment, UNDP became the IA under the DIM (Direct Implementation Modality). With the recruitment and retention of an energetic and capable project manager, and a clearer focus, the project was not only able to more effectively utilise its budget, and spend money on generally relevant and sustainable RE technology-application packages in MHS, but it also put in place very much improved stakeholder buy-in, governance, M&E approaches, and candor in in project reporting. In the 2nd stage risk management and responsiveness to implementation issues was significantly improved. So overall, the IA performance is rated as satisfactory.

EA Execution - Rating #5 - Satisfactory (S)

UNDP as the Executing Agency (EA) worked hard in the 1st stage of the MHS-RE project to get the NIM approach with TEI to work and manage the emerging project implementation risks, and be responsive to implementation issues - with many meetings, and several useful notes-to-file to document their efforts. The mid term review (MTR) RFP was dated May 2013, with the final draft

MTR completed at the end of August 2013. A strategic review was then undertaken and the new 2nd phase of the project was implemented from June 2014 under its Addendum to the ProDoc, which was effectively a new ProDoc. This period between the MTR and the start of the 2nd Phase of the project coincided with severe political unrest in Thailand culminating in a military coup in May 2014. In the 2nd phase of the project from June 2014 the execution of the project was much improved. So overall, the EA performance is rated as satisfactory.

3.3.10 COUNTRY OWNERSHIP

The project had a high level of country ownership in MHS Province amongst relevant RE policy stakeholders. The project's high level of national level ownership is shown by the $2.8 million (92 million Baht) of funding that has already been obtained from Thai government sources (the Thai Energy Conservation Fund) for the EforE Foundation to continue the MHS-RE project's work and focus for 2.5 years (starting 01 October 2017) in MHS Province.

3.3.10 MAINSTREAMING

Key project results are likely to be mainstreamed in ongoing activities in MHS. In particular, ICS, rehabilitation of existing SHS, new generation more affordable packaged DC SHS systems and solar lanterns, biogas in carefully selected niche applications, grid-connected solar PV, RE learning centers and schools RE curriculum are likely to remain as post project-end mainstream activities.

4. CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

CONCLUSIONS:

1) Design, Implementation, and M&E - The MHS-RE project successfully demonstrated generally satisfactory adaptive and timely management by UNDP both as the Executing Agency (EA) for the whole project duration, and as the Implementing Agency (IA) of the 2nd stage. Corrective actions were taken in a generally timely fashion by UNDP as the EA. However, in retrospect the mid term review (MTR) could have usefully been brought forward by say six months, as by the end of 2012 it was already clear that the project was facing severe (and documented) implementation issues that it was questionable that the then 1st Stage IA (of the Thailand Environmental Institute (TEI)) operating under the then default National Implementation Modality (NIM)) was capable of solving. There was also a delay of several months in implementing the strategic review to give effect to the MTR, but this was probably unavoidable as it was in a period of major political instability coup in Thailand that culminated in a military coup in May 2014.

The 2nd stage project design was much improved over the rather vague and unfocussed original ProDoc's design. However the 2nd stage project design's focus on off-grid hydro for the majority of its projected GHG emission reductions still ignored the known and documented problem that the proposed hydros were to be located in protected areas of national parks where hydros were not supposed to be built. This same issue had already been proven in the original project design (and as implanted in the1st stage of the project) to be an impossible hurdle with its focus on on-grid hydros for the bulk of the projected project GHG emission reductions.

Both the original and the reformulated MHS-RE project's designs did not fully identify or document the critical design aspects of the existing MHS RE situation, in particular the: ongoing growth in grid electricity supply in MHS; the core RE problems of inefficient cook stoves being used by 65% of MHS population; the range of user willingness and ability to pay[21]; and the supply chains that already existed in the towns and villages of MHS for technologies such as conventional cook stoves, SHS supply and maintenance, and solar lanterns.

The implementation of the project by UNDP under the Direct Implementation Modality (DIM) in the 2nd Phase was overall very good, so the overall EA performance by UNDP was satisfactory in refocusing the project and in actively managing the project to a generally successful overall end point.

The Monitoring and Evaluation (M&E) of the 1st stage of the project was substandard (as detailed in the Mid-Term Review - MTR), but the M&E performance was much improved in the 2nd stage of the project, with overall satisfactory M&E results achieved by the end of the project's implementation.

2) Project Results - The project achieved satisfactory demonstration results in MHS Province for (1) Improved Cook Stoves (ICS); (2) Solar Home Systems (SHS) and Solar Lanterns; (3) Grid-connected solar-PV rooftop systems for self-consumption; (4) RE Policy Support and

[21] Most rural households in MHS can afford 10,000 Baht value motorcycles (and in some cases a 100,000 Baht value pickup) and are hence not actually too desperately poor to be able to afford a 350 Baht Improved Cook Stove (ICS) or a 150 Baht solar lantern or a modern 3000 Baht packaged basic DC Solar Home System

Integration; and (5) RE Learning Centers. Some useful results were also achieved for Biodigesters.

3) MHS-RE key project supported RE projects such as: Improved Cook Stoves (ICS); biodigesters in the right applications; grid connected PV; appropriately sized and priced SHS; and solar lanterns - are likely to continue to work, are likely to be maintained and renewed at their end of life, and are likely to be copied (replicated) post-project-end[22] by the EforE project that is now already underway in MHS.

4) However, the MHS-RE project lacked an explicit and documented barrier removal and demonstration-replication design approach for each RE Technology-Application Package. The applicable RE technologies deployed were not really new in MHS or in Thailand. Multiple funders and donors support RE in MHS and Thailand, covering most of the same aspects as the MHS-RE project did. The MHS-RE project was just one of many past and present RE technology focused support projects and activities in MHS[23] and Thailand. In addition, the applicable RE Technology-Application Packages were poorly defined in the MHS-RE project. The project also did not have an explicit strategy to wean beneficiaries off an ongoing reliance on ongoing subsidised RE equipment and support in future.

5) Relevance, Stakeholder Engagement, Country Ownership

The MHS-RE project was highly relevant with its general support for RE, its specific support for 'energy for all' off-grid applications, and for its contribution to the Ministry of Energy

[22] These may appear to be obvious points, but many donor funded RE projects support technologies that do not work at all in their particular application or environment, or will not continue working post-project end, or will never realistically be replicated. Examples in the evaluation team leader's personal evaluation experience include Municipal Solid Waste and biomass gasification projects where there is not a sufficient or sustainable MSW or biomass supply or proven RE technology, hydro projects installed that do not work where it is known that for social ownership reasons hydros do not keep working regardless of their merits, and 'off-grid' RE projects in countries where most potential replication applications are already connected or soon to be connected to the grid.

[23] For example, the PEA distributed 14,800 SHS in MHS in 2005-2007, and four off-grid village scale Micro Hydro Projects (MHP) each of 20-25 kW capacity were built by DEDE in MHS from 1995 to 2005 and operated by village cooperatives. The supplied SHS' would supply enough electricity for several 20W light bulbs as well as a 14-inch TV set (50 W), a motorized sewing machine (75 W), a water pump (100 W) or a radio (15 W). The SHS were provided free of charge, including installation. Ref: MHS-RE ProDoc p13.

target for MHS to be the first energy self-sufficient province in Thailand.

The project worked hard in both its 1st and 2nd stages, and achieved satisfactory levels of stakeholder involvement and knowledge of its RE policy support efforts.

The project had a high level of country ownership in MHS Province amongst relevant RE policy stakeholders. The project's high level of national level ownership is shown by the $2.8 million (92 million Baht) of funding that has already been obtained from Thai government sources (the Thai Energy Conservation Fund) for the EforE Foundation to continue the MHS-RE project's work and focus for 2.5 years (starting 01 October 2017) in MHS Province.

6) Impact and Post-Project-End Replication – The results, lessons learned, and the implementation of the recommendations of this TE for the upcoming EforE MHS project are highly likely to continue to make an impact in post-project-end replications. Specifically, the Thailand Energy for Environment Foundation (EforE) $2.775 Million (92 Million Baht) follow-on project to the MHS-RE project has already been approved and has already started from 01 October 2017.

RECOMMENDATIONS

1) Develop Comprehensive Technology-Application Packages - It is recommended that the already approved MHS EforE follow-on project develops comprehensive 'Technology-Application Packages' for the most promising and most relevant RE technology-applications that have been successfully demonstrated in the MHS-RE project, namely: (1) Improved Cook Stoves (ICS) mass replication; (2) New and renovated Solar Home Systems (SHS) and dissemination of solar lanterns; (3) Growing grid-connected solar-PV rooftop systems for user self-consumption; (4) Ongoing support and expansion of RE Learning Centers for wider RE awareness raising; (5) Ongoing MHS RE Policy Support and Integration with other policy objectives; and (6) User co-funded biodigesters (but only in very specific and very targeted applications in MHS).

2) Design for Explicit Post-Project-End Sustainability - It is recommended that the six (6) 'Technology-Application Packages' to be applied in the EforE project include: explicit linkages from project activities and demonstrations to mass-market replications; specific RE technology assessments and prospects; real commercial costs and cost reduction trends; disaggregated real end-user willingness and ability to pay; planning for reducing reliance on future subsidies; building on existing supply chains where possible rather than 'parachuting-in' technologies and providing training and just hoping that post-project-end sustainable

results will somehow occur; and long term sustainability design – instead of just doing a "demo" and just hoping for replication.

3) Map Out Clear End-To-End Intervention Logic - It is recommended that the already approved MHS EforE follow-on project maps out for each of the six (6) 'Technology-Application Packages' demonstrations and replications: key players and critical success factors; clear selection criteria for the demos; clear expectations for demo recipients to assist in replications; identification of end-to-end approval processes for demos/replications; and clear mapping of how the demos will lead to project supported replications, and ultimately to market-led post-project mass replications.

4) Build On Existing Suppliers - It is recommended that the already approved MHS EforE follow-on project maps out for each of the six (6) 'Technology-Application Packages' how it will prioritise working with and building on existing local RE equipment and technical support market suppliers – as 'parachuting in' externally chosen technologies without reference to local suppliers and without reference to local technical support suppliers will leave a post-project situation with an unclear sustainability pathway.

LESSONS LEARNED

1) Wishful Thinking is Not Enough - The 1st lesson learned from the MHS-RE project is that each specific RE application needs a detailed and comprehensive understanding of key approval and success factors before being initiated. For example a new hydro project in a National Park protected area in Thailand needs to be able to demonstrate that it will provide conservation benefits to the core conservation delivery objective (such as providing an electricity supply to a ranger stations) of the national park, without these direct conservation benefits of the new hydro, it cannot get the necessary (DNR) approval. Appealing to the objective of providing electricity supply to a community (that is not actually supposed to be in the national park at all) will not work as this is not a core reason for the approval of new developments in a national park. This was known, but was ignored in the 1st stage of the MHS-RE project for on-grid hydros, and was known and ignored in the 2nd stage with off-grid hydros.

2) Specific RE Technologies for Specific Applications - The 2nd lesson learned from the MHS-RE project for its successor EforE project is to identify and target the appropriate RE technology for a specific application. For example the SHS' provided in large numbers by the Thai

government in the 2000's in MHS and elsewhere were large capacity 220V AC output systems, and hence needed expensive (around 4500 Baht each) charge controllers, batteries and inverters when being rehabilitated. However it appears that a simpler packaged DC PV system may be all that many rural households in MHS really can afford, want or need, such as the 3000 Baht system depicted on this report's front cover page that was found to be already commercially available in MHS town. The MHS-RE project supplied 83,000 Baht SHS as part of its SHS demonstration role. But for the EforE successor project, 83,000 Baht SHS may be more than the households really need, and certainly more than most households are prepared to maintain even if an 83,000 Baht SHS is given to them for free.

3) Many People Can Pay for Appropriate RE Even if Average Incomes are Low - The 3rd lesson learned from the MHS-RE project is to look at the real ability of different groups of rural households to pay, and not assume that all rural households are desperately poor just because average cash incomes are low. For example, nearly every MHS rural household has somehow afforded a 10,000 Baht value motorcycle and can afford 150 Baht of petrol every 1 - 4 weeks and more for tires, batteries, oil changes and other consumables for its motorcycle. So most MHS rural households could pay for a 300 Baht ICS, and many could pay for a 3000 Baht packaged small DC SHS if they really were persuaded of its value to them. A small proportion of really poor households may need assistance, but a rural household with a 10,000 Baht value motorcycle could pay for a 250-350 Baht ICS or a 100 – 200 Baht solar lantern if they really wanted to. And households with a 100,000 baht value pickup truck could probably also afford a more sophisticated SHS with a bigger battery and an inverter for AC power supply for a TV, sewing machine, etc.

4) Demonstrations Are Only Useful If They Lead to Mass Replications - The 4th lesson learned from the MHS-RE project is to plan in the project design for scaling up the supply of the applicable RE technology package if the demo-replication approach is successful. For example, the production of ICS needs to increase by a factor of a hundred from the small-scale hand-made ICS approach successfully piloted in the MHS-RE project. This was not explicitly considered in the MHS-RE project, but needs to be considered in the EforE project design if a sizeable part of the 65% of the 65,000 households in MHS Province that use cookstoves are to achieve the 30-50% reduction in firewood use and the reduction in indoor smoke that a successful mass replication of ICS in MHS Province by the EforE project could deliver.

5) Build on Existing/Sustainable Supply Chains - The 5th lesson from the MHS-RE project is to build on existing supply chains. For example, the evaluation mission visited three general stores in MHS's small towns and found that they already buy 30,000 Baht delivered-cost truckloads of 300 standard cook stoves using existing supply chains. When the EforE successor project creates a mass demand for ICS, and suitable suppliers make ICS in sufficient quantities[24], then existing MHS stores could get them through their existing supply chains. MHS rural villages are already served by merchants in pickups who buy and sell goods to householders, including through existing village small stores, so these merchants could supply ICS via village stores. If new supply chains are developed, then they have to be sustainable post-project-end to be useful.

[24] The MHS-RE project facilitated ICS were individually hand made by a rural cooperative in Chiang Mai for 250 Baht each, with a production capacity of 50 ICS per month. But in the EforE project, for retail general stores in MHS to stock ICS on a serious basis for mass replacement of standard cooks stoves, each MHS Province retail store needs to be able to get a truckload of 300 ICS at a time. And with 65,000 households in MHS, and ICS lasting 3 - 5 years, there needs to be a transition to 13,000 - 22,000 ICS sold in MHS per year. So the MHS-RE successor EforE project that has now started should be working towards a 20 – 40 times increase in existing ICS production and sales. This will require the EforE project to facilitate a transition to mass production, transport and sales of ICS from the MHS-RE project's small-scale hand-built ICS production, transport and distribution mode. This is more important than romantic goals of ICS to be made by rural cooperatives or made in MHS Province. All that that really matters is ICS quality, lifetime, price, and production volume - not where the ICS are physically made or whether cooperative or commercial operators make them.

ANNEX A: ITINERARY

Terminal Evaluation
Travel Agenda BKK-MHS-CNX-BKK
16-25 October 2017

Monday 16 October 2017 (@UNDP Thailand, 12th floor)

Time	Activity
0900-1000	Briefing by UNDP staff
1030-1200	Interview with • Ms. Sutharin Koonphol, Programme Specialist- Team Leader, UNDP Thailand • Mr. Pawin Talerngsri, Programme Analyst, UNDP Thailand Interview with the MHS-RE key service provider Ms. Kannikar Srithunyalucksana, Senior Policy Analyst, Representative from Energy for Environment Foundation

Tuesday 17 October 2017

Time	Activity
0650	Departure from Bangkok to Chiang Mai by plane
0940	Arrival to Mae Hong Son, pick-up and transfer to the hotel by Project Manager (PM)
1030-1130	Briefing about the trip by PM
1300-1315	Depart to MHS City Hall
1330-1400	Courtesy meeting with Mr. Suebsak Iamwichan, Governor of MHS at MHS City Hall
1415-1530	Meeting with: 1) Mr. Thinnakorn Phromkun, Chief of MHS Provincial Energy Office (PEO), 2) Mr. Noppadon Chiamton, Chief of Mae Sanga Micro hydro Power, 3) Mr. Bamrung Sangkhao, Chief of Provincial Strategy and Information, Provincial Office, 4) MHS Provincial Electricity Authority 5) Ms. Jidapa Wongwaikullanat, Foreign Relations Officer, PO 6) Ms. Siriluk Pantanan, Technical Energy Officer, PEO
1540-1635	Recess and depart to Sri Sangwan Hospital
1640-1700	Meeting with Mr. Worachet Thecharak, MD., Director of Sri Sangwan Provincial Hospital. Observe solar rooftop system at 2 buildings and interview Mr. Jesada Tanrup, Chief Technician Overnight at Mountain Inn Hotel, MHS town

Wednesday 18 October 2017

0830	Depart to the 17th Infantry Regiment Task Force
0900-1000	Meeting with Col. Worathep Boonya, Commander and 2nd Lt. Sitthiporn Kraiyoung, Head of Renewable Energy Operation Unit (RE learning center for Army personnel training, SHS rehabilitation to remote communities). Observe the RE Learning Center supported by the project
1030-1130	Meeting with Chief of Pha Bong Solar Power Plant, EGAT. Observe the solar power plant operated by EGAT
1130-1330	Travel to Khun Yuam district and lunch
1300	Arrive Office of Khun Yuam District Local School, meet Mr. Ponlert and depart Ban Mae Surin Noi School
1430-1730	Observe supported activities at some schools: donated solar lanterns, school biodigester, ICS under KY District Local School (off-grid areas, low accessibility, 4WD access only)
	Overnight at Yoont Hotel, KY district, MHS

Phone interview Ms. Dararat Phiewphan, Director of Khun Yuam District Local School (consisting of 8 off-grid schools under the project's support) on RETs supported by the project: ICS, biodigesters, solar lanterns for off-grid/ethnic students by crowd funding and test run of RE curriculum for students

Thursday 19 October 2017

0815	Depart to Ban Pang Tong School
0845-1000	Meeting with Mr. Wirot Khamploi, School Director (RE learning center, solar rooftop system for school dormitory, student occupational skills development, RE curriculum). Observe the systems at girl dormitory and the school's 'Ban Café'
1030-1200	Return to KY town, prepare box lunch. Depart to Mae Ki Tambon (sub-district) Administrative Organization (TAO)
1200-1300	Lunch at the TAO office
1300-1530	Meeting with Mr. Udom Kornsangwijit, TAO Chief Executive. Visit Pha To Village (SHS rehabilitation by Army, solar lanterns by barter trade and ICS) (off-grid area, low accessibility, 4WD access only)
1530-1745	Depart to Hern Tai Resort, Mae La Noi district
	Overnight at Hern Tai Resort, Mae La Noi district, MHS

Friday 20 October 2017

0900-1030	Meeting with Mr. Thiramanat Wongkhiri, owner of Hern Tai Resort and observe solar rooftop system at 2 resort buildings (business model for SME)
1030-1330	Return to MHS town, hotel check in and lunch
1430-1530	MHS Firewood Bank Project under the Royal Initiatives (ICS)
1600-1630	Visit House no.21, Muang district. Observe a 3.72 kWp solar rooftop system for household (business model for individual household)
	Overnight in MHS town (Mountain Inn Hotel)

Saturday 21 October 2017 (Holiday)

AM	Visit Ban Nong Khao Klang Public Health Center, Huai Puling sub-district, Muang district. Observe a 1.5 kWp solar PV system (low accessibility, 4WD access only)
PM	Thanachot resort & Ngam Ta Hotel (Optional: Both do not involve with the project.) Overnight in MHS town (Mountain Inn Hotel)

Sunday 22 October 2017 (Holiday)

AM	Visit Nai Soi Village, Pang Mu sub-district, Muang district. Meeting deputy village headman & owners of biodigesters that the project installed in this village (7 systems)
PM	Optional Overnight in MHS town (Mountain Inn Hotel)

Monday 23 October 2017 (Holiday)

0700	Hotel checkout. Depart from MHS to Chiang Mai by car
1430	Visit Yang Nerng ICS Production Group, Saraphi district, Chiang Mai. The project bought ICS from this group to distribute to beneficiaries in Mae Hong Son since no ICS local producer available. Overnight in Chiang Mai

Tuesday 24 October 2017

0900-1000	Visit Energy Service Center 7 (Chiang Mai): the regional Center supported to the project on ICS, general technical advice, review of RE training manual
100-1100	Visit Mae Jo University (It does not involve with the project, but can provide opinions on RE in MHS)
PM	Depart from Chiang Mai to Bangkok by plane

Wednesday 25 October 2017 (Venue: TBC)

1030-1200	Debriefing at Bangkok (Outside UN Compound) with: • Ms. Sutharin Koonphol, Programme Specialist- Team Leader, UNDP Thailand • Mr. Pawin Talerngsri, Programme Analyst, UNDP Thailand • Ms. Sorat Phutthaphithak, National Project Manager, MHS-RE, UNDP Thailand • Ms. Milou Beerepoot, UNDP Regional Technical Specialist • Ms. Sirinapa Visessmith, Project Assistant, MHS-RE, UNDP Thailand

ANNEX B: LIST OF PERSONS INTERVIEWED

List of Interviewees by TE Team

	Name	Position	Organization	Contact detail	Date - Time
1	Dr. Sutharin Koonphol	Program Specialist- Team Leader, Inclusive Green Growth and Sustainable Development	UNDP, Thailand Country Office	+02 2809100 ext. 2148 sutharin.koonphol@undp.org	16 Oct 10.00-12.00
2	Dr. Pawin Talerngsri	Program Analyst, Inclusive Green Growth and Sustainable Development		+02 2804294 Pawin.talerngsri@undp.org	
3	Ms Kannikar Srithunyaoucksana	Senior Policy Analyst	Energy for Environment Foundation (EforE)	+02 9539881-4 ext. 140 kannikar@efe.or.th	16 Oct 14.30-16.00
4	Ms. Sirinapa Visessmith	Project Assistant	UNDP MHS RE Project, based in BKK	Sirinapa.visessmith@undp.org	16 Oct 14.30-16.00
5	Ms. Sorat Phutthaphithak	Project Manager	UNDP MHS RE Project, based in MHS	089 0477478 sorat.phutthaphithak@undp.org	17 Oct 11.00-12.30 26 Oct 14.30-16.30
6	Mr. Suebsak Iamwichan	Governor	MHS Province	089-203-0465 053-612-158	17 Oct 13.30-14.15
7	Ms. Jidapa Wongwaikullanat	International Affair Officer	MHS Provincial Office	081-860-9643 airjia@hotmail.co.th	17 Oct 13.30-15.30
8	Mr. Thinnakorn Phromkun	Chief of PEO	MHS Provincial Energy Office	053-611276	17 Oct 14.00-16.30
9	Mr. Noppadon Chiamton	Head of Hydro Power Plants	Mae Sa-nga Micro-hydro Power Plant	084-613-5657 089-835-3039 Nopphadon_c@hotmail.com	

10	Med.Doc. Mr. Cheewa Mungmee	Deputy Director, acting director	Sri Sangwan Provincial Hospital	053-611-378	17 Oct 16.45-18.00
11	Mr. Kamphol	Deputy Director, Administration		084-040-6604	
12	Mr. Jessada Tunrop	Chief of Administration Unit		084 3758235	
13	Mr. Inthaporn	Chief of Maintenance Unit			
14	Ms. Siriluk Pantanan	Technical Officer	MHS Provincial Energy Office	084-244-979 giggs_sanook @hotmail.com	17 Oct 18.00-19.30
15	Col. Worathep Boonya	Head of the Task Force	17th Infantry Regiment Task Force Mae Hong Son	086-179-9438	18 Oct 09.30-10.30
16	Lt. Sittiporn Kraiyoung	Leading Trainer		053-613-190 081-885-6081 086-1799438	
17	Mr. Phongphan Chaiyapruek	Head of EGAT Power Plant	Pha Bong Solar Power Plant	086-181-4399	18 Oct 11.00-12.30
18	Mr. Pornlert Sa-ardjit	Teacher	Mae Surin Noi Boarding School		18 Oct
19	Ms. Chanpen	Teacher			
20	Ms. Suthiporn	Teacher			
21	Mr. Worote Khamploy	Director	Pang Tong Boarding School	089 9510604 khumploy@hotmail.com	19 Oct 09.00-11.00
22	Mr. Pornsak Srisiri	Science Subject Teacher		086 1163887	
23	Mr. Tiramanus Wongkeeree (Net)	Owner and Manager	Hern Tai Mae La Noi	086 9153555 053 689033 Herntairesort @hotmail.com	20 Oct 08.30-10.30

24	Mr. Udom Khonseangwijit	Chief Executive,	Mae Gi Tambon Administration Organization (TAO)	080 0344066	20 Oct 11.30-12.30
25	Mr. Rangsan Khophol	Director	Firewood Bank Royal Project, Royal Forest Department	081 9617707	20 Oct 16.00-16.40
26	Ms. Tanatcha Trongsuwan	Trainer officer		062 2630492	20 Oct 16.00-17.00
27	Mr. Woraphan Amrarong	House owner	Cicada House No.21, Udom-chaonithed, Jongkham, Muang District, MHS	081 6713257	20 Oct 18.00-20.00
28	Ms. Suchawalee Amrarong	House-wife		086 4285384	
29	Mrs. Neeranuch Doungmontri	Housekeeper	Nong Klaw Klang District Hospital		21 Oct 10.00-11.00
30	Mr. Sorawut Moolthi	Security Office	Huay Pu Ling TAO	094 0943408	21 Oct 11.30-12..30
31	Mr. Suphap Phanthong	Emergency Car Driver		086 4748970	
32	Mr. Vichai Kittisiriphan	Owner and Manager	MHS Satellite Dish	053 620183	22 Oct 08.30-09.30
33	Mr. Vichai Wannathorn	Vice Village Headman	Ban Nai Soy Village, Pang Mooh Subdistrict	086 1794844	22 Oct 10.00-12.00
34	Ms. Pen	House owner		0947846619	
35	Ms. Pikul Cheeppanit	House owner			
36	Mr. Udom Apichai	Chief of Center	Yang Nueng Sub-district, Agricultural Technical Transfer Center, Sarapee District, Chiang Mai		23 Oct 15.00-18.00
37	Mr. Udom Chanda	Cooking Stove Team Leader			
38	Ms. Phakdi Chanda	Cooking Stove Team		080 1268655	
39	Mr. Ruengdech Yawichai	Center Member			
40	Mr. Phanlop	Center Member			

41	Mr. Chaianan Chaifuey	Center Member			
42	Ass. Prof. Sermsuk Buacharoen	Advisor to Renewable Collage	Mae Jo University, San Sai District, Mae Jo University	089-261-8453 kagoshi7@gmail.com	24 Oct 09.30-11.00
43	Mr. Waiyawete Na-Ake	Director	Technical Service Center 7 (Chiang Mai), DEDE, San Sai District, Chiang Mai	053-353-064 081-950-4441 waiyawet@yahoo.co.th	24 Oct 11.15-12.30
44	Dr Milou Beerepoot	Regional Technical Advisor (RTA)	UNDP-GEF, Bangkok Regional Hub (BRH)		25 Oct 11.15-12.30
45	Ms. Warin Choosai Na Ayuthaya	Former Project Manager of UNDP-MHS RE Project		081 4992445 warin.choomsai@undp.org	02 November

ANNEX C: DOCUMENTS REVIEWED

GEF-CEO Signed FSP Project Approval to Proceed to Thailand Govt Approval of Project Document

Inception Phase Guidelines

ProDoc as signed by UNDP Thailand Resident Representative and MHS Governor

2011 Main Events and Achievements

2011 – 2013 UNDP Notes to File

2011 - 2013 Quarterly Reports (QR) and Project Implementation Reviews (PIRs)

2013 Work Plan

RFP for Mid Term Review

2013 Work Plan Schedule of Activities

Duties and Responsibilities of Project Personnel

2011- June 2013 Proposed Demo Site Implementation Status

Notes of Process and Progress discussion and contacts on Small Hydro Power Plants (in Thai)

List of Research/Studies conducted in Phase 2 (2013)

MTR Final Report

Strategic Committee Serving as MHS-RE Project Board - Minutes of MTE Results Meeting

UNDP-GEF Approval for Change to DIM

Project Board Minutes for #1 to #7 PB Meetings (2nd stage of project)

Approved Addendum to ProDoc (Effectively New 2nd Stage ProDoc)

Micro Hydro Power - Ground Survey Training

ICS Review Report - by UNDP PMU

Official DNP Letter re Non Approval of Small Hydro Power plant at Ban Pay Song Ngeang, MoNRE No.910.505/2020, dated 01 February 2016 (in Thai)

Official DNP Letter re Non Approval of Small Hydro Power plant at Ban Na Jed Log, MoNRE No.910.505/8258, dated 02 May 2016 (in Thai)

2016-2017 Annual Work Plan

MHS Special RE Zone Report

UNDP-Thailand MHS-RE Facebook Entries - 29 July 2017 - 10 May 2016

Project Monitoring Report

2017 Project Implementation Report (PIR)

QPR for Jul-Sep 2017

TE Procurement Notice and TOR

Project Budget Balance of Commitments + Expenses - 17 Sept to 31 Dec 2017 (Summary Level)

Project Budget-Expenditure Breakdown by Component and by Year

Full List of Project Partners for Potential Interviews

Project Tracking Tool, at baseline, at mid-term, and at terminal points UNDP

Development Assistance Framework (UNDAF)

UNDP Country Programme Document (CPD)

UNDP Country Programme Action Plan (CPAP)

GEF focal area strategic program objectives

Draft Version of Curriculum on Renewable Energy for Primary Schools in MHS (in Thai)

UNDP Country Programme Document (CPD)

UNDP Country Programme Action Plan (CPAP)

GEF focal area strategic program objectives

ANNEX D: EVALUATION RATING SCALES

Ratings for Effectiveness, Efficiency, Overall Project Outcome Rating, M&E, IA & EA Execution	***Sustainability ratings:***	***Relevance ratings***
6. Highly Satisfactory (HS): no shortcomings 5. Satisfactory (S): minor shortcomings 4. Moderately Satisfactory (MS): moderate shortcomings 3. Moderately Unsatisfactory (MU): significant shortcomings 2. Unsatisfactory (U): major shortcomings 1. Highly Unsatisfactory (HU): severe shortcomings	4. Likely (L): negligible risks to sustainability 3. Moderately Likely (ML): moderate risks 2. Moderately Unlikely (MU): significant risks 1. Unlikely (U): severe risks	2. Relevant (R) 1. Not relevant (NR)
Additional ratings where relevant: Not Applicable (N/A)		

ANNEX E: EVALUATION QUESTIONS MATRIX

Evaluative Criteria / Questions	Indicators	Sources	Methodology
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?			
• Was the project relevant to UNCBD and other international convention objectives?	Project aligned with UNCBD's Aichi Targets: Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced. Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	• UNCBD Website: Strategic Plan: Aichi Target	• Document analysis • Desk review
• Was the project relevant the GEF climate change focal area?	• Project aligned with GEF6 Climate Change Mitigation Focal Area 1. *Promotion of innovation, technology transfer, and supportive policies and strategies*.	• GEF 6 Programming Direction	• Document analysis • Desk review
• Was the project relevant to Thailand's environment and sustainable development objectives?	• Project aligned with Thailand's 12th National Economic and Social Development Plan: ○ Strategy 4: Strategy for Environmentally Friendly Growth for Sustainable Development, which indicated as ○ Target 3 Creating good environmental qualities, reducing pollution and minimizing impacts on people's health and ecosystems.	• Thailand's 12th National Economic and Social Development Plan • https://sustainabledevelopment.un.org/memberstates/thailand • http://www.tsdf.or.th/en/seminar-	• Document analysis • Desk review and field observation

	○ Target 4: Increasing the efficiency of GHG reduction and enhancing the capacity for climate change adaption. • Project aligned with Thailand's Intended Nationally Determined Contribution (INDC) for GHG reductions of 7-20% by 2020. • Project aligned with Thailand's Sustainable Development Goal: Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all; and 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.	event/10268/sustainable-development-goals-sdgs	
• Was the project addressing the needs of target beneficiaries at the local and regional levels?	• Public, private, and individual villagers have gained benefits from the project both directly and indirectly. • Reduction of energy cost achieved for SriSangWan Hospital, and another nine (9) public buildings. • Reduction of energy cost of small hotels in Khun Yuam District achieved. • Reductions in household LPG and firewood consumption in remote villages achieved. • Improving quality of life for school children in remote villages from solar lanterns achieved. • Improving quality of life for women from the fumes while cooking in the sharing space for kitchen/bedroom achieved.	• Project Mid-term report • Project partners	• Desk review, • Interview and field observation
• Was the project internally coherent in its design?	• Regular M&E stock takes conducted by a consultant • More than 100 project team meetings and 7 board meetings held	• Mid-term Review Report • Project Monitoring Report (August 2017)	• Desk review and interview

• How was the project relevant with respect to other donor-supported activities?	• Project supported better quality of life for marginal people, including the refugees that are supported by UNHCR in Mae Hong Son.	• Project manager	• Interview
• Did the project provide relevant lessons and experiences for other similar projects in the future?	• Lesson learnt, recommendations and all contact people to be transferred to the new Thai Energy Conservation Fund funded Project to Promote RE in MHS (E4E)	• E4E Representative, Ms Kannikar Srithunyaoucksana	• Interview
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?			
• Has the project been effective in achieving the expected outcomes and objectives?	Objective level: • Not achieved in term of GHG Reduction, • Fully achieved in term of RE models successfully demonstrated, and their operation. Project serves as a knowledge product for new 92 Million Baht ($2.7million) E4E project that is now underway. Outcome level: • Outcomes 1, 2, 4, 5, 6, 9, 10, 12, 13, 14, 15, 16, 17, 18 and 19 were achieved • Outcomes 3, 7, 11 are no longer applicable target indicators. • Outcome 8 was partially achieved.	• M&E Report in August 2017	• Desk review
• How was risk and risk mitigation being managed?	• By the Project Management Unit in MHS in consultation with the Project Board in MHS and UNDP CO in Bangkok.	• Project Manager, UNDP CO	• Interviews
• What lessons can be drawn regarding effectiveness for other similar projects in the future?	• Need to define and develop interventions that are oriented more towards building on existing market-based institutions and structures.	• TE team	• Interviews and observations

Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?			
• Was project support provided in an efficient way?	• Slow project support on procurement was found to cause delay in SHS rehabilitation intervention, as rainy season limited accessibility of MHS highlands' remote villages.	• M&E Report in August 2017 • Project managers	• Desk review and interviews
• How efficient were partnership arrangements for the project	• Project Board in MHS was set up with agendas, minutes and appropriate representation. Around seven (7) PB meetings were conducted in Phase 2.	• M&E report, August 2017	• Desk review and Interviews
• Did the project efficiently utilize local capacity in implementation?	• Local capacity on RE in MHS was confirmed to be limited. The project successfully utilised capacity available in nearby provinces (in particular in Chiang Mai and Tak provinces). • Local existing partners (Royal Thai Army, school, and Forestry research center) joined the project as learning and training centers. • Existing merchandisers of Electronic devices, Cable TV, and cooking stove suppliers (including town and village based general stores) shops could have been utilized more effectively. • No international consultants were involved in the project, in spite of this being specified for the 2nd stage of the project's implementation.	• M&E Report August 2017 • Data collected during TE mission.	• Desk review • Interviews • Observations
• What lessons can be drawn regarding efficiency for other similar projects in the future?	• Location should have been agreed and formal Forestry Department in Bangkok permission should have been obtained for installing new hydropower projects before on-grid or off-grid hydros were included in detailed project planning or project support. New hydros should be located outside protected areas, rather that in national forest reserves as was done in the MHS-RE project. • Written approval for the solar roof Installation at Cicada House in MHS city should have been obtained	• PEA Mae Sa-nga Power Plant Manager • House owner	• Interview • Interview

	before the PV installation started. Verbal approval or agreement does not constitute legal approval. • Proper situation, problem, barrier removal and stakeholder analysis, local supporting actors with key partners in MHS would have facilitated improved project intervention design and implementation.	• TE findings	• Data analysis
Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?			
• Were interventions designed to have sustainable results given the identifiable risks?	• Fully financing pilot Solar panels at public buildings and at SriSangWan hospital led to successful donor and crowd funding for further solar panels at SriSangWan Hospital. This fund-raising is in place and is growing. • Project co-financing of solar panel installation at Hern-tai Resort was a useful demonstration to other resorts/hotels and has been a useful selling point for the resort. • Crowd funding for Solar Lanterns and ICS has successfully demonstrated the likely financial sustainability of this approach post project end.	• Project reports • Med.Doc. Mr. Cheewa Mungmee • Mr. Tiramanus Wongkeeree (Owner of the Hern Tai) resort • Consultant progress reports	• Desk study • Interview
• What issues emerged during implementation as a threat to sustainability?	• The extension of high voltage transmission lines from zero to three 115 kV lines into MHS, and the expansion of the 22 kV medium voltage grid with MHS and the increasing in grid connections in the expanded grid coverage was noted in the ProDoc and the Addendum to the ProDoc but was not fully addressed in the project's implementation.	• Mr. Thinnakorn Phromkun MHS Provincial Energy Office	• Interview
• Are there social or political risks that may threaten the sustainability of project outcomes?	• No significant social or political risks were observed. • On the other hand, RE in MHS is rather a useful tool for (local/provincial) politician to build their popularity, and could be a useful selling point for the important and growing MHS tourism industry.	• Mr. Suebsak Iamwichan, Governor of MHS.	• Interview

• Are there on going activities that pose an environmental threat to the sustainability of project outcomes?	• None observed.	• TE field mission	• Document review and TE observations
• Have the entities/people that will carry on the project been identified and prepared?	• The E4E Foundation will build on MHS-RE project results and will continue promoting RE in MHS with the Thai ENCON (Energy Conservation) Funding approved of $2.7 million for another 2.5 years.	• E4E Representative, Ms Kannikar Srithunyaoucksana • UNDP CO	• Interview
• Is there evidence financial resources are committed to support project results after the project has closed?	• The Thailand ENCON (Energy Conservation) Fund has supported the implementation of a new $2.7 million 2.5 year successor project to support the uptake of RE in MHS by the E4E Foundation, which started in October 2017.	• E4E Representative, Ms Kannikar Srithunyaoucksana	• Interview
Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?			
• Has the project made verifiable environmental improvements?	• Reduction of firewood collection was achieved from natural forest after the use of ICS. • Reduction of indoor smoke was achieved in the living/kitchen/sleeping rooms at household level after the use of ICS. • Reduction of bad odor was achieved from confined pig at household by the bio-digesters.	• Project beneficiaries	• Interview
• Has the project made verifiable reductions in stress on environmental systems?	• Reduction of firewood collection was achieved from protected forest areas achieved with project-supported use of ICS. • Reduction of household -level indoor smoke was achieved in living/kitchen/sleeping rooms with the use of project supported ICS.	• Project beneficiaries	• Interviews

	• Reduction of bad odors was achieved from confined household pigs by their dung being fed into bio-digesters.		
• Has the project demonstrated progress towards these impact achievements?	• Project-supported ICS users confirmed enjoying direct benefits from their use, and that they would be willing to buy replacement ICS if they were readily available in local markets. • Growing markets of grid-connected solar PV, rehabilitated SHS, new lower cost packaged SHS, and solar lanterns in MHS could be supplemented by solar PV use for water-pumping and off-grid farm hut applications in the future.	• Project beneficiaries • Mr. Vichai Kittisiriphan - Owner and Manager of Satellite Dish shop in MHS	• Interviews

ANNEX F: PROJECT BUDGET-EXPENDITURE BREAKDOWN BY COMPONENT AND BY YEAR

	Year							
Activity	2011	2012	2013	2014	2015	2016	2017	Grand Total
	662.42	-1560.94	11234.3	127.13	235.38	235.38	176.58	11110.25

ACTIVITY1	44811.23	104837.46	96918.93	19792.16	67522	7418.43	358.9	341659.11
ACTIVITY2	127051.18	154724.31	230231.36	7350.24	108126.95	165774.27	106800.06	900058.37
ACTIVITY3	57847.63	97982.42	90850.29		19926.64	54418.47	154741.89	475767.34
ACTIVITY4	20163.61	51651.97	35419		21291.36	134534.11	120186.25	383246.3
ACTIVITY5	2116.93	14874.82	91224.63	20450.74	9725.16			138392.28
ACTIVITY6	48889.88	46615.94	37299.54	85606.44	11730.34	12324.53	5478.92	247945.59
(blank)								
Grand Total	301542.88	469125.98	593178.05	133326.71	238557.83	374705.19	387742.6	2498179.24

ANNEX G: EVALUATION QUESTIONAIRE

The following is *the KII (Key Informant Interview) questionnaire* for the MHS-RE TE. As not all respondents will have the same level of knowledge with regard to the MHS-RE project, the questionnaire will be used in a flexible fashion in KII interviews.

Introduction: Good morning/afternoon and thank you for taking the time to speak with us today. We have been engaged by UNDP-GEF to perform the MHS-RE project external independent terminal evaluation after nearly six years of project implementation. The evaluation objective is to determine what project components and activities that worked well and why, and which did not and why. We are not evaluating individual entities or activities, rather we want to better understand the entire project from its foundation to its implementation and any changes made and why, or why not. The evaluation will provide relevant information, statistics, and judgments that will provide UNDP-GEF with what has been accomplished, performance ratings, lessons learned, and information to improve similar future projects.

Our Evaluation Team has had the opportunity to review many documents provided by UNDP-GEF to get a better understanding of the design and implementation of the MHS-RE project. However, such documents can only tell us so much.

We would like to speak with you today to hear about your experience, in your own words, in order to help us better understand how the MHS-RE project functioned, the challenges it faced, how these challenges were addressed, and the results of the MHS-RE project.

Confidentiality

We may include quotes from respondents in the evaluation report, but we will not link individual names, organizations, or personally identifiable information to those quotes, unless the respondent consents to this.

GENERAL

1. Before we begin, could you tell us a bit about your role within the MHS-RE project?

2. Do you feel that the MHS-RE project was closely aligned with international, national, regional or provincial energy policy priorities and the GHG emissions reduction commitments of Thailand?

3. In your opinion, how effective was the MHS-RE project in achieving its objectives?

4. In your opinion, how did the MHS-RE project help Thailand achieve long-term and sustained reduction of GHG emissions and the more effective use of energy?

Outcome 1: Strengthened institutional, organizational and social capacity results in planning, management and implementation of integrated RE programmes in MHS

1. Do you feel that the project has achieved useful results in this area?

2. Were the challenges to achieving project goals in this area effectively addressed during the project's implementation? Could these challenges have been better predicted than they were?

3. What do you think were the key institutional, organizational and social capacity results of the project?

4. How have recent external changes (both legislative and economic) affected the activities of the project?

Outcome 2: Financially sustainable RE systems operational in MHS

1. Was awareness raised of key stakeholders involved in RE projects in MHS regarding the social, economic and environmental costs and benefits of RE systems?

2. Were grid-linked RE systems established by the project that were integrated with provincial development plans?

3. Were suitable off-grid renewable energy electrical systems to local communities established by the project?

4. To what extent were non-electrical renewable energy uses promoted by the project?

5. To what extent do you think that the RE systems established by the project will be financially sustainable after the project has ended?

Outcome 3: Technical support is available locally for the development, management, and maintenance of RE applications in MHS

1. How could you describe the capacity of the RE technical support now available in MHS in relation to that which existed in 2011 when the project started?

2. How well have the trainings and in maintenance and repairs of RE systems been delivered?

3. To what extent have people trained by the project used their new technical support capacity?

Outcome 4: Policies facilitate up-scaling and replication of RE systems in Thailand

1. To what extent were lessons learned documented and disseminated to policy makers and included in national policies?

2. To what extent were centers of learning in MHS promoting RE as part of the Sufficiency Economy established?

ANNEX H: EVALUATION TOR

TERMINAL EVALUATION TERMS OF REFERENCE (INTERNATIONAL CONSULTANT)

INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of Promoting Renewable Energy in Mae Hong Son Province (PIMS #3908).

PROJECT SUMMARY TABLE

Project Title:	Promoting Renewable Energy in Mae Hong Son Province			
GEF Project ID:	3908		*at endorsement (Million US$)*	*at completion (Million US$)*
UNDP Project ID:	00059287 (UNDP output ID)	GEF financing:	2,712,700.00	
Country:	Thailand	IA/EA own:		
Region:	Asia-Pacific	Government:		
Focal Area:	Energy	Other (UNDP):		
FA Objectives, (OP/SP):		Total co-financing:		
Executing Agency:	UNDP Thailand	Total Project Cost:	2,712,700.00	
Other Partners involved:	Office of the Governor, MHS Province Provincial Energy Office , MHS Province Department of Alternative Energy Development and Efficiency (DEDE), MHS Province	ProDoc Signature (date project began):		23 December 2010
		Operational Closing Date:	Proposed: 31 December 2017	Actual:

PURPOSE, OBJECTIVE AND SCOPE:

The Project Objective is "to overcome barriers to the provision of Renewable Energy (RE) services in integrated provincial renewable energy programmes in Thailand". This will contribute to the broader Goal of reducing GHG emissions in Thailand. Importantly, it will also contribute to the Goal of Thailand's GEF strategy, which is to mobilize GEF resources in support of the implementation of Sufficiency Economy principles, as enshrined in the 10th National Economic and Social Development Plan.

Following a Mid-Term-Review (MTR) in Q3 of 2013, significant changes were made to the project framework and the implementation modality. In the second phase of the project the focus is more on off-grid renewable energy applications and the project implementation modality is Direct Implementation (DIM).

The second phase of the project aims at facilitating an integrated RE planning process at provincial and local level, in order to translate targets set at national level to local level and into real action. The four components of the project focus on (a) institutional capacity development for planning and implementing RE programmes; (b) access to financing; (c) technical training and education and (d) policies for up-scaling and replication.

In order to realize the project objective, the project was designed to comprise of four components, each of which addressing a specific category of barriers to renewable energy development in MHS. The project components and outputs for the remaining period of the project are:

Outcome 1: Strengthened institutional, organizational and social capacity results in planning, management and implementation of integrated RE programmes in MHS	
Output 1.1	Strengthened capacities, mobilization and co-ordination mechanisms for integrated RE planning in MHS
Outcome 2: Financially sustainable RE systems operational in MHS	
Output 2.1	Awareness raised of all stakeholders involved in RE projects regarding social, economic and environmental costs and benefits of RE systems
Output 2.2	Grid-linked RE systems established consistent with integrated provincial development plans
Output 2.3	Off-grid renewable energy electrical systems to local communities established
Output 2.4	Non-electrical renewable energy promoted
Outcome 3: Technical support is available locally for the development, management and maintenance of RE applications in MHS	
Output 3.1	Completed trainings in maintenance and repair of RE systems
Outcome 4: Policies facilitate up-scaling and replication of RE systems in Thailand	
Output 4.1	Lessons learned documented and disseminated to policy makers and included in national policies

Output 4.2	Centre of learning in MHS promoting RE as part of the Sufficiency Economy established

The RE technology focussed during the second phase of the project has 7 items:

1. Off-grid micro-hydropower
2. On-grid solar farm
3. Solar home system (SHS) rehabilitation and solar lanterns
4. Improved cookstoves (ICS)
5. Provincial integrated RE planning
6. Solar rooftop and Energy Efficiency measures in government buildings
7. Biodigesters

Described in the Addendum of the Project Document that at the end of the second phase of the project, the following are the expected outcomes on the ground:

- 1 on-grid solar farm project approved, installed and operational (500 kW);
- 100 SHS rehabilitated (100*120 Wp);
- 200 solar lanterns sold (200*2.5W);
- 20 additional biodigesters at schools, SMEs and farms installed and operational;
- 2 off-grid hydropower plants approved, installed and operational (2*30 kW);
- 10 solar rooftop systems approved, installed and operational (10*200 W);
- 1 EE project in gov. building approved, implemented and operational (RE capacity 600 W savings);
- 10 villages in which ICS have been tried out and being used in MHS by end of 2016 (50 systems).
- Direct reduction of GHG emissions due to operation of these systems is about 14,216 tonnes CO2.

IN 2016, due to development complexities on the ground, several project results were modified. These included the unattained micro-hydro power (MHP), solar farm and solar rooftop. Below are the new agreed results for the 2017 project extension period endorsed by the Project Board on 25 May 2016, and later by UNDP CO and the regional office on 14 November 2016:

RE Technology	New Outputs/Results

Solar farm	• Modify to solar PV system; • Install the solar PV system to 1-2 off-grid school(s) and 1-2 local/ district hospital(s); • Number of the target schools and capacity of the system to be installed will depend on the needs, technical requirements and the remaining budget of the solar farm (around THB 1.5 million).
SHS rehabilitation	• Support 60 systems of SHS rehabilitation in remote/ border communities to be implemented by the Army's RE Operation Unit of the 17th Infantry Regiment Task Force in MHS (in addition to the achieved result of 103 systems) with provision of operation and maintenance trainings to village technicians/ house owners.
Solar PV rooftops	• Install a grid-connected solar PV system to 1-2 local/ district hospitals with EE measures & other RETs (i.e. solar water boiler), if needed, using budget from the remaining budget of the solar farm activity; • Install & revitalize solar PV system to additional 2-3 off-grid schools (in addition to the modified ones from solar farm activity); • Support 50% start-up investment fund of solar PV rooftop installation cost to individual SME/ hotel (8-11 kWp); other RETs can be considered, if appropriate; • Support & facilitate the installation by reusing abandoned solar PV panels to at least 1 government building (1-3 kWp); • Increase 20-50 kWp generation capacity to the current 4.5 kWp at the provincial hospital system, depending on the project budget.
ICS	• Support additional 200 units of ICS to 5 ethnic & watershed communities in an exchange to a community reforestation activity (in addition to the achieved result of 130 units).
Biodigesters	• Support additional 6 units to individual farms, with the same operational model, trainings & start-up investment fund, follow-up/ after sales service (in addition to the achieved result of 30 systems).
Other RETs	• Explore & install other RETs such as solar water boiler & chiller in government building with technologically suited to local needs.

RE financial support model	• Launch crowdsourcing on solar lanterns, solar PV system for hospitals, ICS.

The total project budget is USD. US$ 2,712,700.

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 projects 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.

EVALUATION APPROACH AND METHOD

An overall approach and method[25] 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 (*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 Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is expected to conduct a field mission to Thailand including the project sites in Mae Hong Son (MHS) province.

At the project sites, key stakeholders include MHS Provincial Office, MHS Provincial Energy Office, the local governments, schools and communities should be interviewed.

Interviews will be held with the following personnel and organizations and individuals at a minimum:

Representative of Responsible Parties, including:

[25] For additional information on methods, see the Handbook on Planning, Monitoring and Evaluating for Development Results, Chapter 7, pg. 163

- Governor of MHS
- Chief of MHS Provincial Office
- Chief of MHS Provincial Energy Office
- Members of the Project Board
- Chiefs of Tambon (sub-district) Administrative Organizations (local governments)
- Directors of school, hospitals
- Representatives from target communities
- Representative from the key service provider of the project

Project Team

- Project Manager
- Project Field Officer
- Project Assistant

UNDP Country Office in Bangkok in-charge of this project. UNDP:

- BRH Regional Technical Specialist,
- IGSD/ UNDP Thailand Programme Manager

The evaluator will review all relevant sources of information, such as the project document, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, 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. The full scope methods used in the evaluation are at the discretion of the evaluator(s), but a mixed method of document review, interviews, and direct observations should be employed, at a minimum. The TE inception report and TE report should explain all the evaluation methods used in detail.

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.

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

PROJECT FINANCE / COFINANCE

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(s) 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 environment, governance, and gender.

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) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.[26]

CONCLUSIONS, RECOMMENDATIONS & LESSONS

The evaluation report must include a chapter providing a set of **conclusions**, **recommendations** and **lessons**.

IMPLEMENTATION ARRANGEMENTS

The principal responsibility for managing this evaluation resides with the UNDP CO in Thailand. The UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

EVALUATION TIMEFRAME

The total duration of the evaluation will be *19* days over a time period from 1 September to 30 November 2017 according to the following plan:

Activity	Timing	Tentative Period
Preparation	4 working days	*11-14 September 2017*
Evaluation Mission	7 working days (Monday-Friday); per diem will be paid on working days and over the weekends.	*9-13 October 2017 and 16-17 October 2017;* *Note: 17 October 2017 (debriefing at UNDP CO)*
Draft Evaluation Report	5 working days	*23-27 October 2017*

[26] A useful tool for gauging progress to impact is the Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office: ROTI Handbook 2009

Final Report	3 working days	*20-22 November 2017*

EVALUATION DELIVERABLES

The evaluation team is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
Inception Report	Evaluator provides clarifications on timing and method	No later than 2 weeks before the evaluation mission: *15 September 2017*	Evaluator submits to UNDP CO
Presentation	Initial Findings	End of evaluation mission: *17 October 2017*	To project management, UNDP CO
Draft Final Report	Full report, (per annexed template) with annexes	Within 1 week after the evaluation mission: *30 October 2017*	Sent to CO, reviewed by RTA, PCU, GEF OFPs
Final Report*	Revised report	Within 1 week of receiving UNDP comments on draft: *23 November 2017*	Sent to CO for uploading to UNDP ERC.

*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. See Annex H for an audit trail template.

DUTY STATION

Home-based with travel to Bangkok and Mae Hong Son, Thailand

TEAM COMPOSITION

The evaluation team will be composed of *an international and a national evaluator.* The consultants shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. The international evaluator will be designated as the team leader and will be responsible for finalizing the report. The evaluators selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

The team members must present the following qualifications:

A. INTERNATIONAL LEAD CONSULTANT

PROFILE

- Post-Graduate in energy, environmental studies, engineering, development studies, social sciences and/ or other related fields (15%)
- Minimum of 8 years accumulated and recognized experience in the field of energy policy, rural energy development planning, sustainable development (20%)
- Minimum of 5 years of project evaluation and/or implementation experience in the result-based management framework, adaptive management and UNDP or GEF Monitoring and Evaluation Policy (20%)
- Familiarity in similar country or regional situations relevant to that of Promoting Renewable Energy in Mae Hong Son Project is an advantage (5%).
- Experience with multilateral and bilateral supported renewable energy, sustainable realization and utilisation of RE technologies (10%)
- Comprehensive knowledge of international best practices in renewable energy, poverty reduction and sustainable development (15%)
- Excellent written English (15%)

RESPONSIBILITIES

- Documentation review
- Leading the TE Team in planning, conducting and reporting on the evaluation
- Deciding on division of labour within the Team and ensuring timeliness of reports
- Use of best practice evaluation methodologies in conducting the evaluation
- Leading the drafting and finalization of the Inception Report for the Terminal Evaluation
- Leading presentation of the draft evaluation findings and recommendations in-country
- Conducting the de-briefing for the UNDP Country Office in Thailand and Core Project Management Team
- Leading the drafting and finalization of the Terminal Evaluation Report

B. INTERNATIONAL CONSULTANT

PROFILE

- Post-graduate in energy, environmental studies, engineering, development studies, social sciences and/ or other related fields (15%)
- Minimum of 5 years of supporting project evaluation and/or implementation experience in the result-based management framework, adaptive management and UNDP or GEF Monitoring and Evaluation Policy (20%)
- Eight (8) years of project development and implementation (15%)
- Some project management experience in energy, environment, and sustainable development (10%) would be an advantage.
- Multilateral and bilateral funded project development and implementation (10%)
- Familiarity with Thailand national development policies, programs and projects (20%)
- Excellent in written and spoken English (10%)

RESPONSIBILITIES

- Documentation review and data gathering
- Contributing to the development of the review plan and methodology
- Conducting those elements of the evaluation determined jointly with the international consultant and UNDP
- Contributing to presentation of the review findings and recommendations at the wrap-up meeting
- Contributing to the drafting and finalization of the review report

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'.

PAYMENT MODALITIES AND SPECIFICATIONS

%	Milestone
10%	At submission and approval of inception report
50%	Following submission and approval of the 1st draft terminal evaluation report
40%	Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report

APPLICATION PROCESS

Recommended Presentation of Proposal:

a) Letter of Confirmation of Interest and Availability using the template27 provided by UNDP;
b) CV and a Personal History Form (P11 form28);
c) Brief description of approach to work/technical proposal of why the individual considers him/herself as the most suitable for the assignment, and a proposed methodology on how they will approach and complete the assignment; (max 1 page)
d) Financial Proposal that indicates the all-inclusive fixed total contract price and all other travel related costs (such as flight ticket, per diem, etc.), supported by a breakdown of costs, as per template attached to the Letter of Confirmation of Interest template. If an applicant is employed by an organization/company/institution, and he/she expects his/her employer to charge a management fee in the process of releasing him/her to UNDP under Reimbursable Loan Agreement (RLA), the applicant must indicate at this point, and ensure that all such costs are duly incorporated in the financial proposal submitted to UNDP.

All application materials should be submitted by CoB 17 April 2017. Incomplete applications will be excluded from further consideration.

Criteria for Evaluation of Proposal: Only those applications which are responsive and compliant will be evaluated. Offers will be evaluated according to the Combined Scoring method – where the educational background and experience on similar assignments will be weighted at 70% and the price proposal will weigh as 30% of the total scoring. The applicant receiving the Highest Combined Score that has also accepted UNDP's General Terms and Conditions will be awarded the contract.

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27 https://intranet.undp.org/unit/bom/pso/Support%20documents%20on%20IC%20Guidelines/Template%20for%20Confirmation%20of%20Interest%20and%20Submission%20of%20Financial%20Proposal.docx

28 http://www.undp.org/content/dam/undp/library/corporate/Careers/P11_Personal_history_form.doc

ANNEX A: PROJECT LOGICAL FRAMEWORK (REVISED LOGICAL FRAMEWORK MATRIX DURING 2016 PIR)

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
Overall Goal: The reduction of GHG emissions in Thailand					
Project Objective: To overcome barriers to the provision of Renewable Energy (RE) services in integrated provincial renewable energy programmes in Thailand					
Project Objective 1:	Increase of power generation capacity and usage from RE systems in MHS both on-grid and off-grid	RE power generation capacity in MHS amounts to 29,220 MW (on grid) and 255 kW (off-grid).	By the end of the project RE power generation capacity in MHS amounts to 29,720 MW (on grid) and more than 315 kW (off- grid). Additional RE power generation capacity of 500 kW (solar farm) and 60 kW (off grid hydro) and several solar applications realized.	Project Reports, DEDE statistics	Economic growth in the country will continue
Project Objective 2:	Models for RE generation & application which can be replicated in other areas demonstrated.	No new models for RE generation & application.	At least 3 new models for RE generation & application developed and operational. Models ready to be replicated in other areas (hydro, solar and biodigesters)	Project Reports, DEDE statistics	Government support for RE development and utilization will not change
Outcome 1: Strengthened institutional, organizational and social capacity results in planning, management and implementation of integrated RE	1) No. of RE projects proposed by government agencies in line with provincial plan	0	At least 2 RE projects proposed by government agencies in line with provincial plan	Project reports, meeting reports	- Continued government support for RE - Capacity of government does not substantially delay approval of RE policies and RE projects
	2) No. of working RE management models established	0	At least 3 management models established (off-grid hydro, biodigesters, solar)		

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
programmes in MHS					
Outcome 2: Financially sustainable RE systems operational in MHS	3) No. of on-grid solar farm projects approved, installed and operational in MHS by end of 2016	3 *(total 2,880 kW – June 2014)*	1 additional on-grid solar farm project approved, installed and operational in MHS by end of 2016 (capacity 500 kW)	Project reports, approval documents, surveys	- Continued government support and support from communities for RE - Capacity of government and communities does not substantially delay approval of RE policies and implementation of RE projects
	4) No. of SHS rehabilitated in MHS by end of 2016	0	100 SHS rehabilitated in MHS by end of 2016 (100*120 Wp)		
	5) No. of solar lanterns sold in MHS by end of 2016	0	200 solar lanterns sold in MHS by end of 2016 (200*2.5W)		
	6) No. of biodigesters installed at schools, SMEs and farms in MHS by end of 2016 with support from project	33 (at SMEs/hh – June 2014)	20 additional biodigesters at schools, SMEs and farms installed and operational in MHS by end of 2016 with support from project (average size 8 m3)		
	7) No. of off-grid micro-hydropower projects approved, installed and operational in MHS by end of 2016	9 (255 kW – June 2014)	2 off-grid hydropower plants approved, installed and operational in MHS by end of 2016 (2*30 kW)		

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
	8) No. of solar rooftop installations approved, installed and operational in MHS by end of 2016	0	10 solar rooftop systems approved, installed and operational in MHS by end of 2016 (with support from the project) (10*200 W)		
	9) No. of EE projects in gov. buildings approved, implemented and operational in MHS by end of 2016	0	1 EE project in gov. building approved, implemented and operational in MHS by end of 2016 (RE capacity 600 W savings)		
	10) No. of villages in which ICS have been tried out and are being used in MHS by end of 2016	0	10 villages in which ICS have been tried out and being used in MHS by end of 2016 (50 systems)		
Outcome 3: Technical support is available locally for the development, management and maintenance of RE applications in MHS	11) No. of village technicians trained to operate and maintain off-grid hydropower plants	0	4 village technicians trained to operate and maintain off-grid hydropower plant by end of 2016	Project reports, training evaluations	- Continued government support for RE - Capacity of government does not substantially delay approval of RE policies and RE projects
	12) No. of village technicians trained to maintain rehabilitated SHS	No knowledge (center) or experts easily available	10 village technicians trained to maintain rehabilitated SHS by end of 2016		

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
	13) No. of technicians trained on EE measures and solar rooftop installation	0	2 government technicians trained on EE measures and solar rooftop installation		
	14) No. of users trained in the operation and maintenance of biodigesters	0	20 users of biodigesters trained to operate and maintain the systems		
	15) An improved design of an ICS suitable for situation in MHS	0	Improved design for ICS suitable for MHS finalized		
Outcome 4: Policies facilitate up-scaling and replication of RE systems in Thailand	16) Documented and published experiences/lessons learned from all technologies implemented by end of 2016	0	By end of 2016 all lessons learned documented and published	Project reports, Centre of learning reports and lessons learned report	- Sufficient annual replenishment of RE development and investment funds - Capacity of government does not substantially delay approval of RE policies and RE projects
	17) Center of learning approved and operational in MHS by end of 2016	0	Center of learning approved and operational by end of 2016		
	18) Guidelines published No. of lessons learned included in policy making at central level	0	At least 2 guidelines for replication published e.g. a) on management models for off-grid applications b) incentive schemes/financial model for RE		

	Indicator	Baseline	Targets End of Project	Source of verification	Assumptions
	19) Lessons learned documented	0	At least 2 important lessons learned included in policy making at central level		

ANNEX B: LIST OF DOCUMENTS TO BE REVIEWED BY THE EVALUATORS

GEF Project Information Form (PIF), Project Document, and Log Frame Analysis (LFA)

Project Implementation Plan

Implementing/Executing partner arrangements

List and contact details for project staff, key project stakeholders, including Project Boards, and other partners to be consulted

Project sites, highlighting suggested visits

Mid Term Review (MTR) Report

Annual Project Implementation (APR/PIR) Reports

Project budget and financial data

Project Tracking Tool, at baseline, at mid-term, and at terminal points

UNDP Development Assistance Framework (UNDAF)

UNDP Country Programme Document (CPD)

UNDP Country Programme Action Plan (CPAP)

GEF focal area strategic program objectives

ANNEX C: EVALUATION QUESTIONS

This Evaluation Criteria Matrix must be fully completed/amended by the consultant and included in the TE inception report and as an Annex to the TE report.

For the sample evaluation criterial matrix, please refer to Annex 4 of the TE Guidance http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf]

Evaluative Criteria Questions	Indicators	Sources	Methodology
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?			
• Is the project relevant to UNCBD and other international convention objectives?	•	•	•
• Is the project relevant the GEF climate change focal area?	•	•	•
• Is the project relevant to Thailand's environment and sustainable development objectives?	•	•	•
• Is the project addressing the needs of target beneficiaries at the local and regional levels?	•	•	•
• Is the project internally coherent in its design?	•	•	•
• How is the project relevant with respect to other donor-supported activities?	•	•	•
• Does the project provide relevant lessons and experiences for other similar projects in the future?	•	•	•
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?			
• Has the project been effective in achieving the expected outcomes and objectives?	•	•	•
• How is risk and risk mitigation being managed?	•	•	•

• What lessons can be drawn regarding effectiveness for other similar projects in the future?		•	•
Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?			
• Was project support provided in an efficient way?	•	•	•
• How efficient are partnership arrangements for the project	•	•	•
• Did the project efficiently utilize local capacity in implementation?	•	•	•
• What lessons can be drawn regarding efficiency for other similar projects in the future?	•	•	•
• Effectiveness: To what extent have/ will the expected outcomes and objectives of the project been/be achieved?	•	•	•
• Has the project been effective in achieving the expected outcomes and objectives?	•	•	•
• How is risk and risk mitigation being managed?	•	•	•
• What lessons can be drawn regarding effectiveness for other similar projects in the future?	•	•	•
• Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?	•	•	•
• Was project support provided in an efficient way?	•	•	•
• How efficient are partnership arrangements for the project?	•	•	•
• Did the project efficiently utilize local capacity in implementation	•	•	•
Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?			
• Were interventions designed to have sustainable results given the identifiable risks?	•	•	•

• What issues emerged during implementation as a threat to sustainability?	•	•	•
• Are there social or political risks that may threaten the sustainability of project outcomes?	•	•	•
• Are there ongoing activities that pose an environmental threat to the sustainability of project outcomes?	•	•	•
• Have the entities/people that will carry on the project been identified and prepared?	•	•	•
• Is there evidence financial resources are committed to support project results after the project has closed?	•	•	•
Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?			
• Has the project made verifiable environmental improvements?	•	•	•
• Has the project made verifiable reductions in stress on environmental systems?	•	•	•
• Has the project demonstrated progress towards these impact achievements?	•	•	•

ANNEX D: RATING SCALES

Ratings for Effectiveness, Efficiency, Overall Project Outcome Rating, M&E, IA & EA Execution	***Sustainability ratings:***	***Relevance ratings***
6. Highly Satisfactory (HS): no shortcomings 5. Satisfactory (S): minor shortcomings 4. Moderately Satisfactory (MS): moderate shortcomings 3. Moderately Unsatisfactory (MU): significant shortcomings 2. Unsatisfactory (U): major shortcomings 1. Highly Unsatisfactory (HU): severe shortcomings	4. Likely (L): negligible risks to sustainability 3. Moderately Likely (ML): moderate risks 2. Moderately Unlikely (MU): significant risks 1. Unlikely (U): severe risks	2. Relevant (R) 1. Not relevant (NR)
Additional ratings where relevant: Not Applicable (N/A) Unable to Assess (U/A)		

ANNEX E: EVALUATION CONSULTANT CODE OF CONDUCT AND AGREEMENT FORM

Evaluators:

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 an 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 imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation Consultant Agreement Form[29]

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

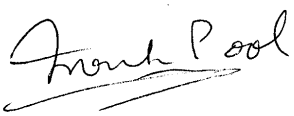
Name of Consultant: __Frank Pool_____

Name of Consultancy Organization (where relevant)**:** Frank Pool Clean Energy Consulting

[29]www.unevaluation.org/unegcodeofconduct

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at *Wellington* on *08 December 2017*

Signature: 

ANNEX F: EVALUATION REPORT OUTLINE[30]

i. Opening page:
- Title of UNDP supported GEF financed project
- UNDP and GEF project ID#s
- Evaluation time frame and date of evaluation report
- Region and countries included in the project
- GEF Operational Program/Strategic Program
- Implementing Partner and other project partners
- Evaluation team members
- Acknowledgements

ii. Executive Summary
- Project Summary Table
- Project Description (brief)
- Evaluation Rating Table
- Summary of conclusions, recommendations and lessons

iii. Acronyms and Abbreviations

(See: UNDP Editorial Manual[31])

1. Introduction
- Purpose of the evaluation
- Scope & Methodology
- Structure of the evaluation report

2. Project description and development context
- Project start and duration
- Problems that the project sought to address
- Immediate and development objectives of the project
- Baseline Indicators established
- Main stakeholders
- Expected Results

3. Findings

(In addition to a descriptive assessment, all criteria marked with (*) must be rated[32])

3.1 Project Design / Formulation
- Analysis of LFA/Results Framework (Project logic /strategy; Indicators)
- Assumptions and Risks
- Lessons from other relevant projects (e.g., same focal area) incorporated into project design
- Planned stakeholder participation
- Replication approach
- UNDP comparative advantage
- Linkages between project and other interventions within the sector
- Management arrangements

[30]The Report length should not exceed *40* pages in total (not including annexes).

[31] UNDP Style Manual, Office of Communications, Partnerships Bureau, updated November 2008

[32] See Annex D for rating scales.

3.2 Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation)
- Partnership arrangements (with relevant stakeholders involved in the country/region)
- Feedback from M&E activities used for adaptive management
- Project Finance
- Monitoring and evaluation: design at entry (*), implementation (*), and overall assessment (*)
- Implementing Agency (UNDP) execution (*) and Executing Agency execution (*), overall project implementation/ execution (*), coordination, and operational issues

3.3 Project Results

- Overall results (attainment of objectives) (*)
- Relevance (*)
- Effectiveness (*)
- Efficiency (*)
- Country ownership
- Mainstreaming
- Sustainability: financial resources (*), socio-economic (*), institutional framework and governance (*), environmental (*), and overall likelihood (*)
- Impact

4. Conclusions, Recommendations & Lessons

- Corrective actions for the design, implementation, monitoring and evaluation of the project
- Actions to follow up or reinforce initial benefits from the project
- Proposals for future directions underlining main objectives
- Best and worst practices in addressing issues relating to relevance, performance and success

5. Annexes

- ToR
- Itinerary
- List of persons interviewed
- Summary of field visits
- List of documents reviewed
- Evaluation Question Matrix
- Questionnaire used and summary of results
- Evaluation Consultant Agreement Form
- Report Clearance Form
- *Annexed in a separate file:* TE audit trail
- *Annexed in a separate file:* Terminal GEF Tracking Tool

ANNEX G: EVALUATION REPORT CLEARANCE FORM

(to be completed by CO and UNDP GEF Technical Adviser based in the region and included in the final document)

Evaluation Report Reviewed and Cleared by

UNDP Country Office

Name: _____

Signature: _____ Date: _____

UNDP GEF RTA

Name: _____

Signature: _____ Date: _____

ANNEX H: TE REPORT AUDIT TRAIL

This annex covers the comments received on 24 November 2017 from UNDP regarding the Terminal Evaluation of the Thailand: Promoting Renewable Energy in Mae Hong Son Province (MHS-RE) UNDP-GEF Project UNDP PIMS: 3908

The following comments were provided in track changes to the draft Terminal Evaluation report.

Section	Commenter	Comment	TE Response
Brief Project Description	Margarita Arguella	I would suggest to slightly change the wording of the first sentence to be in line with the standard way that the UNDP-GEF Unit refers to GEF-financed projects. Below is suggested wording. "Promoting Renewable Energy in Mae Hong Son Province" (MHS-RE project) is a (GEF) financed project implemented from 2010 to 2017 with support from the United Nations Development Programme (UNDP).	Adjusted accordingly
Table of Content	Milou Beerapoot	I think there should be a Table of Contents first and only then the Brief Project Description, Project Ratings, Executive Summary etc.	Adjusted accordingly
Brief Project Description	Milou Beerapoot	I think the project description could also briefly address the barriers that the project was targeting (project rationale0 and also explain the project goal.	Adjusted accordingly
Brief Project Description	Milou Beerapoot	I don't like to wording of "two MHS-RE projects" , that would not be in line with GEF regulations	Adjusted accordingly
Brief Project Description	Milou Beerapoot	Apart from the fact that this statement is probably disputable, more importantly this is not the right place for such statement. The heading of this text says "Brief project description" and this statement is not appropriate in a project description.	Adjusted accordingly
Brief Project Description	Sutharin Koonphol	By whom?	Adjusted accordingly
Project Results	Sutharin Koonphol	By whom?	Adjusted accordingly
Brief Project Description	Sutharin Koonphol	The reason is known in Phase 1 not at the design phase. There are regulations on the use of protected areas for a long time. But before 2012, DEDE can still install mini-micro hydro power in Mae Hong Son with relatively easy procedures and permission from DNP. Hence the prodoc in Phase 1 relies heavily on micro hydro.	Adjusted accordingly

		It was in 2012 that DNP and energy regulator became stricter. The project made a calculated risk to work on the hydro in Phase 2 for the following reasons: (1) Mae Hong Son Province would like to be able to make use of the hydro power which are in abundant in the province to improve livelihoods, and within the extent that the environmental impact is minimal; (2) The feasibility carefully undertaken shown that it is possible and the intervention is very small; (3) There was willingness to collaborate in developing the proposal to follow the rules and regulations to ask for the permission from DNP from all key stakeholders: Provincial Office, Provincial Natural Resource Office, Superintendents of the concerned national parks, and local communities (which the project didn't have in its first phase of NGO Implementation). There is a minute of the project board, which recorded the need of the province and the agreement to take this on. (4) A GEF project is meant to provide "incrementality" to existing situation in country. It should be taken as an opportunity to create platform / new opportunity to address challenges that could not be addressed in business as usual circumstances. The decision to pursue the micro hydro in phase 1 despite knowing the difficulties is because if successful – it could pave way to other cases and allow communities in Mae Hong Son to be able to benefit from the hydro power, which can also be linked to the awareness to conserve the forests to ensure the provision of the water ecosystem services. As discussed at the debriefing, this is to do with incoherent policy and unclear rule and regulation. But what is assessed here and later on in the draft report – makes it sound like the project continue to work on mini hydro blindly, which is not quite fair because this point has been explained to the TE team both at the opening and the debriefing meetings.	
Project Objective	Milou Beerapoot	Apart from the fact that this statement is probably disputable, more importantly this is not the right place for such statement. The heading of this text says "Brief project description" and this statement is not appropriate in a project description.	
Evaluation Rating Table	Milou Beerapoot	I would like to see a section on project results before jumping into conclusions, the section discussion project results could address results for project goal, project objective and per component/outcome to give some structure to the text The text describing the project results should be the foundation	Adjusted accordingly

		and provide argumentation for the ratings since the ratings are now provided without context.	
Conclusion	Milou Beerapoot	What is the basis for this statement?	Clarification done
Conclusion	Sutharin Koonphol	The original project document provided details of RE situation and situation in Mae Hong Son.	Adjusted accordingly
Conclusion	Sutharin Koonphol	The intention of the project both Phase 1 and Phase 2 is not that RE is something new to be introduced to MHS but how to make the adoption of RE viable and sustainable.	Adjusted accordingly
Lesson Learned	Milou Beerapoot	This refers to something that happened outside the project, please mention an example from within the project?	Adjusted accordingly
Lesson Learned	Milou Beerapoot	Strange formulation?	Adjusted accordingly
Acronyms and Abbreviations	Margarita Arguella	Complete the list	Adjusted accordingly
Section 2: Project Description and development context	Margarita Arguella	Within section 2, there should be a sub-section for 'Main Stakeholders' (as per the standard TE report outline)	Adjusted accordingly
Problems	Milou Beerapoot	I feel this section is rather short and not exactly explaining the problems and barriers that the project was intending to address. There should be more explanation and background information to give the following sections sufficient context.	Adjusted accordingly
Mid Term Review	Milou Beerapoot	I don't like to wording of "two MHS-RE projects" , that would not be in line with GEF regulations	Adjusted accordingly
Mid Term Review	Milou Beerapoot	Sentence should be reformulated, it says key changes in plural but only mentions one, also the part that starts with "a refocusing….levels" seems as if this is an unfinished sentence: refocusing from what to what?	Adjusted accordingly
Re-stated context	Milou Beerapoot	Can the text in this section be a bit more elaborate and reformulated in somewhat more professional type of wording? It now seems more like a notebook style reporting (with largest part of text copied from Addendum and the analysis following in 2 short sentences).	Adjusted accordingly

2.3 Immediate and Development objectives	Milou Beerapoot	This section only has text copied directly from the ProDoc? Can there be an elaboration on the baseline situation in the original ProDoc and development over time and changes in the baseline situation at the time of the MTR when the project scope was revised?	Adjusted accordingly
3.1 Project Design	Milou Beerapoot	In general, I find the approach in this chapter confusing: some sections are only discussing the original MHS project approach (e.g. LFA, assumptions and risks, etc,) whereas other sections are also referring at the 2nd phase of the project (e.g. replication approach).	Adjusted accordingly
3.1 Project Design	Sutharin Koonphol	I think this assessment is not fair. If you read the original project document and the addendum carefully, you will see that the project intends to build on existing efforts/ pipeline plans of DEDE and PEA and to add on incremental value. For example, DEDE can install micro hydro according their function and mandate but how to build technical skills, management skills for O&M as well as getting organized into a group and/or cooperative (in the case of the on-grid as envisaged in the first phase of the project) – this is where the MHS RE supposes to provide additionality. On hydro, pls see comment on page 4	Adjusted accordingly
Analysis of LFA/Results Framework	Margarita Arguella	Discuss the planned outcomes in terms of whether or not they were SMART (S-specific M-measurable A-achievable R-relevant T-time bound).	Adjusted accordingly
Analysis of LFA/Results Framework	Milou Beerapoot	This section now only discusses (very briefly) the original ProDoc's results framework. It would be more useful if also the results framework after the MTR would be discussed and, more interestingly, some analysis on the changes in result framework from original to post-MTR and implications for project delivery/results. To give you an example of another TE (where some 2 pages were dedicated to this section): "As previously mentioned, there were 2 planning matrices for the xxxx Project. While this section is devoted to the analysis of the 2013 (and revised) Project Results framework (PRF), the Evaluation Team has the following comments on the original Log frame Matrix (LFM) that was prepared in 2003" "The revised Project Results framework (PRF) for the xxx Project provides 22 indicators (1 goal indicator, 1 objective-level indicator, 4 outcome level indicators and 16 output level indicators) to guide implementation of the Project towards its	Adjusted accordingly

		overall Project goal of "xxxx". In the opinion of the evaluation team, the absence of SMART indicators and clear targets in this revised PRF raised the level of difficulty in effectively managing this Project. Specific comments on the quality of the revised PRF follows:" "Overall, the quality of the project planning matrices for the xxx Project (both the original LFA of 2006 in the ProDoc and the revised PRF in 2013) can be rated as xxx. Indicators and targets for monitoring by the PMU needed to be simplified with timelines to clearly articulate what was to be achieved by the end of the xxxx Project."	
Assumptions and Risks	Margarita Arguella	Only assumptions are discussed here. This section should also include an assessment of the risks (outlined in the risk log in the prodoc). Were the risks well articulated in the prodoc?	Clarification done
Assumptions and Risks	Milou Beerapoot	Perhaps this text could start with an overview of the risks and mitigation measures identified in the ProDoc and then analysing which ones were unrealistic, with text explaining why these were unrealistic? The way it is formulated now it comes across as a bit unprofessional (jumping into conclusions right away and then summing up without analysis).	Adjusted accordingly
Assumptions and Risks	Sutharin Koonphol	As mentioned, during the original design phase it was still very feasible to install mini/ micro hydro in MHS	Adjusted accordingly
Lessons from other Relevant Project	Milou Beerapoot	I am not sure if this analysis makes sense. The barriers that are mentioned above are of course not a consequence of the technology itself but are a consequence of the business model that was used at the time (100% grant without local ownership or an O&M sustainable operation model). I think the original MHS-RE project design tried to address these barriers by means of a different business model: the community ownership and O&M training as well as different financing approach. I therefore think it is not possible to say that the MHS set-up was not realistic because it was addressing the same technologies as before which failed when it was done by DEDE (which the text is now suggesting).	Adjusted accordingly
Planned Stakeholder Participation	Sutharin Koonphol	How and why, pls elaborate	Adjusted accordingly
Planned Stakeholder Participation	Margarita Arguella	How were stakeholders involved in project formulation and design? Provide an assessment on stakeholder participation and involvement during the formulation stage.	Adjusted accordingly

UNDP Comparative Advantage	Margarita Arguella	This section could be expanded to discuss UNDP's experience with similar projects in the country (and/or in the region). What does "suitably stable management structure" refer to…the CO? Or the CO and regional office? Please elaborate.	Adjusted accordingly
UNDP Comparative Advantage	Milou Beerapoot	This section could dedicate some more text on content: e.g. policy focus of thAe project, UNDP's track record on energy projects, creating local capacities etc.	Adjusted accordingly
Project Implementation	Margarita Arguella	As already noted by Sutharin, this section is missing all the required sections: -Adaptive management -Partnership arrangements -Feedback from M&E activities used for adaptive management -Project Finance -M&E: design at entry, implementation, and overall assessment -Implementing Agency execution and Executing Agency execution, overall project implementation/execution, coordination and operational issues Please refer to the TE guidance	Adjusted accordingly
Project Results (missing section)	Margarita Arguella	There should be a sub-section on 'Country Ownership' under 'Project Results'. I see that country ownership was briefly discussed in conclusion #5, but there should still be a section dedicated to this under 'Project Results'.	Adjusted accordingly
Project Results (missing section)	Margarita Arguella	There should be a sub-section on 'Mainstreaming' under 'Project Results'.	Adjusted accordingly
UNDP and Implementating Partner Implementation	Milou Beerapoot	The analysis seems to jump into ratings without some elaboration on and analysis of activities under each of the Outcomes. I would suggest to make a table, based on the Results Framework, in which the Outcomes indicators, baseline level, targets and status of achievement of the target are described, ideally with additional column with "comments" . This can then provide a basis for discussing the ratings.	Adjusted accordingly
3.3.1 Overall Results	Sutharin Koonphol	It would be good to provide context here, as K Sorat explained at the debriefing, that the process of developing the curriculum has involved the local school teachers and the content has been shaped up with their participation together with the expert hired by the project	Clarification done

3.3.1 Overall Results	Sutharin Koonphol	What is the TE team own assessment on this aspect?	Clarification done
Effectiveness	Sutharin Koonphol	As explained on P 4, the decision to go ahead with hydro is not out of ignorance but as a calculated risk. Whether the risk is well-calculated and thought through, is subject to your assessment. This should be reflected more accurately.	Adjusted accordingly
3.3.7 Sustainability	Margarita Arguella	This section should include discussion on each of the four risks to sustainability (financial resources, socio-economic, institutional framework and governance, environmental). The text on the four risk in this section should support the ratings that were provided in the Evaluation Rating table on page 5.	Adjusted accordingly
3.3.9 IA and EA Execution	Margarita Arguella	Include discussion on: candor and realism in in annual reporting, quality of risk management, responsiveness to implementation issues.	Adjusted accordingly
Conclusion (3)	Milou Beerapoot	I'm not sure if this conclusion is in line with other parts of the TE where there is discussion on e.g. SHS systems sustainability?	Clarification done
Annexes	Margarita Arguella	Be sure to include the 'Evaluation Consultant Agreement Form' and signed 'Report Clearance' form as Annexes in the final draft. The TE Audit Trail and GEF Terminal Tracking Tool should also be annexes but should not be attached to the file that is posted in the ERC.	Done

Special Notes: reporting on lifetime emissions avoided
Lifetime direct GHG emissions avoided: Lifetime direct GHG emissions avoided are the emissions reductions attributable to the investments made **during the project's supervised implementation period**, totaled over the respective lifetime of the investments. **Lifetime direct post-project emissions avoided:** Lifetime direct post-project emissions avoided are the emissions reductions attributable to the investments made outside the project's supervised implementation period, but supported by financial facilities put in place by the GEF project, totaled over the respective lifetime of the investments. These financial facilities will still be operational after the project ends, such as partial credit guarantee facilities, risk mitigation facilities, or revolving funds. **Lifetime indirect GHG emissions avoided (top-down and bottom-up):** indirect emissions reductions are those attributable to the long-term outcomes of the GEF activities that remove barriers, such as capacity building, innovation, catalytic action for replication. Please refer to the Manual for Calculating GHG Benefits of GEF Projects. Manual for Energy Efficiency and Renewable Energy Projects Manual for Transportation Projects For LULUCF projects, the definitions of "lifetime direct and indirect" apply. Lifetime length is defined to be 20 years, unless a different number of years is deemed appropriate. For emission or removal factors (tonnes of CO2eq per hectare per year), use IPCC defaults or country specific factors.

ANNEX I: TRACKING TOOL FOR CLIMATE CHANGE MITIGATION PROJECTS

General Data	Results at Terminal Evaluation	Notes
Project Title	Promoting Renewable Energy in Mae Hong Son Province	
GEF ID	3359	
Agency Project ID	3908	
Country	Thailand	
Region	EAP	
GEF Agency	UNDP	
Date of Council/CEO Approval	February 17, 2010	Month DD, YYYY (e.g., May 12, 2010)
GEF Grant (US$)	2,712,700	
Date of submission of the tracking tool	July 8, 2017	Month DD, YYYY (e.g., May 12, 2010)
Is the project consistent with the priorities identified in National Communications, Technology Needs Assessment, or other Enabling Activities under the UNFCCC?	1	Yes = 1, No = 0
Is the project linked to carbon finance?	1	Yes = 1, No = 0
Cumulative cofinancing realized (US$)	580,703	
Cumulative additional resources mobilized (US$)		additional resources means beyond the cofinancing committed at CEO endorsement

Objective 1: Transfer of Innovative Technologies		
Please specify the type of enabling environment created for technology transfer through this project		
National innovation and technology transfer policy		Yes = 1, No = 0
Innovation and technology centre and network		Yes = 1, No = 0
Applied R&D support		Yes = 1, No = 0
South-South technology cooperation		Yes = 1, No = 0
North-South technology cooperation		Yes = 1, No = 0
Intellectual property rights (IPR)		Yes = 1, No = 0
Information dissemination		Yes = 1, No = 0
Institutional and technical capacity building		Yes = 1, No = 0
Other (please specify)		
Number of innovative technologies demonstrated or deployed		
Please specify three key technologies for demonstration or deployment		
Area of technology 1		
Type of technology 1		specify type of technology
Area of technology 2		
Type of technology 2		specify type of technology
Area of technology 3		
Type of technology 3		specify type of technology
Status of technology demonstration/deployment		0: no suitable technologies are in place 1: technologies have been identified and assessed 2: technologies have been demonstrated on a pilot basis 3: technologies have been deployed 4: technologies have been diffused widely with investments 5: technologies have reached market potential
Lifetime direct GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime direct post-project GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (bottom-up)		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (top-down)		tonnes CO2eq (see Special Notes above)

Objective 2: Energy Efficiency		
Please specify if the project targets any of the following areas		
Lighting		Yes = 1, No = 0
Appliances (white goods)		Yes = 1, No = 0
Equipment		Yes = 1, No = 0
Cook stoves	1	Yes = 1, No = 0
Existing building		Yes = 1, No = 0
New building		Yes = 1, No = 0
Industrial processes		Yes = 1, No = 0
Synergy with phase-out of ozone depleting substances		Yes = 1, No = 0
Other (please specify)		
Policy and regulatory framework		0: not an objective/component 1: no policy/regulation/strategy in place 2: policy/regulation/strategy discussed and proposed 3: policy/regulation/strategy proposed but not adopted 4: policy/regulation/strategy adopted but not enforced 5: policy/regulation/strategy enforced
Establishment of financial facilities (e.g., credit lines, risk guarantees, revolving funds)		0: not an objective/component 1: no facility in place 2: facilities discussed and proposed 3: facilities proposed but not operationalized/funded 4: facilities operationalized/funded but have no demand 5: facilities operationalized/funded and have sufficient demand
Capacity building		0: not an objective/component 1: no capacity built 2: information disseminated/awareness raised 3: training delivered 4: institutional/human capacity strengthened 5: institutional/human capacity utilized and sustained
Lifetime energy saved	2,202,362	MJ (Million Joule, IEA unit converter: http://www.iea.org/stats/unit.asp) Fuel savings should be converted to energy savings by using the net calorific value of the specific fuel. End-use electricity savings should be converted to energy savings by using the conversion factor for the specific supply and distribution system. These energy savings are then totaled over the respective lifetime of the investments.
Lifetime direct GHG emissions avoided	266	tonnes CO2eq (see Special Notes above)

Lifetime direct post-project GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (bottom-up)	797	tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (top-down)		tonnes CO2eq (see Special Notes above)

Objective 3: Renewable Energy		
Please specify if the project includes any of the following areas		
Heat/thermal energy production	1	Yes = 1, No = 0
On-grid electricity production	1	Yes = 1, No = 0
Off-grid electricity production	1	Yes = 1, No = 0
Policy and regulatory framework	5	0: not an objective/component 1: no policy/regulation/strategy in place 2: policy/regulation/strategy discussed and proposed 3: policy/regulation/strategy proposed but not adopted 4: policy/regulation/strategy adopted but not enforced 5: policy/regulation/strategy enforced
Establishment of financial facilities (e.g., credit lines, risk guarantees, revolving funds)	3	0: not an objective/component 1: no facility in place 2: facilities discussed and proposed 3: facilities proposed but not operationalized/funded 4: facilities operationalized/funded but have no demand 5: facilities operationalized/funded and have sufficient demand
Capacity building	5	0: not an objective/component 1: no capacity built 2: information disseminated/awareness raised 3: training delivered 4: institutional/human capacity strengthened 5: institutional/human capacity utilized and sustained
Installed capacity per technology directly resulting from the project		
Wind		MW
Biomass		MW el (for electricity production)
Biomass	0.19	MW th (for thermal energy production)
Geothermal		MW el (for electricity production)
Geothermal		MW th (for thermal energy production)
Hydro		MW
Photovoltaic (solar lighting included)	0.043	MW
Solar thermal heat (heating, water, cooling, process)		MW th (for thermal energy production, 1m² = 0.7kW)
Solar thermal power		MW el (for electricity production)

Marine power (wave, tidal, marine current, osmotic, ocean thermal)		MW
Lifetime energy production per technology directly resulting from the project (IEA unit converter: http://www.iea.org/stats/unit.asp)		
Wind		MWh
Biomass		MWh el (for electricity production)
Biomass	8,135.94	MWh th (for thermal energy production)
Geothermal		MWh el (for electricity production)
Geothermal		MWh th (for thermal energy production)
Hydro		MWh
Photovoltaic (solar lighting included)	690	MWh
Solar thermal heat (heating, water, cooling, process)		MWh th (for thermal energy production)
Solar thermal power		MWh el (for electricity production)
Marine energy (wave, tidal, marine current, osmotic, ocean thermal)		MWh
Lifetime direct GHG emissions avoided	1,390	tonnes CO2eq (see Special Notes above)
Lifetime direct post-project GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (bottom-up)	4,169	tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (top-down)		tonnes CO2eq (see Special Notes above)

Objective 4: Transport and Urban Systems		
Please specify if the project targets any of the following areas		
Bus rapid transit		Yes = 1, No = 0
Other mass transit (e.g., light rail, heavy rail, water or other mass transit; excluding regular bus or minibus)		Yes = 1, No = 0
Logistics management		Yes = 1, No = 0
Transport efficiency (e.g., vehicle, fuel, network efficiency)		Yes = 1, No = 0
Non-motorized transport (NMT)		Yes = 1, No = 0
Travel demand management		Yes = 1, No = 0
Comprehensive transport initiatives (Involving the coordination of multiple strategies from different transportation sub-sectors)		Yes = 1, No = 0
Sustainable urban initiatives		Yes = 1, No = 0

Policy and regulatory framework		0: not an objective/component 1: no policy/regulation/strategy in place 2: policy/regulation/strategy discussed and proposed 3: policy/regulation/strategy proposed but not adopted 4: policy/regulation/strategy adopted but not enforced 5: policy/regulation/strategy enforced
Establishment of financial facilities (e.g., credit lines, risk guarantees, revolving funds)		0: not an objective/component 1: no facility in place 2: facilities discussed and proposed 3: facilities proposed but not operationalized/funded 4: facilities operationalized/funded but have no demand 5: facilities operationalized/funded and have sufficient demand
Capacity building		0: not an objective/component 1: no capacity built 2: information disseminated/awareness raised 3: training delivered 4: institutional/human capacity strengthened 5: institutional/human capacity utilized and sustained
Length of public rapid transit (PRT)		km
Length of non-motorized transport (NMT)		km
Number of lower GHG emission vehicles		
Number of people benefiting from the improved transport and urban systems		
Lifetime direct GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime direct post-project GHG emissions avoided		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (bottom-up)		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (top-down)		tonnes CO2eq (see Special Notes above)

Objective 5: LULUCF		
Area of activity directly resulting from the project		
Conservation and enhancement of carbon in forests, including agroforestry		ha
Conservation and enhancement of carbon in nonforest lands, including peat land		ha

Avoided deforestation and forest degradation		ha
Afforestation/reforestation		ha
Good management practices developed and adopted		0: not an objective/component 1: no action 2: developing prescriptions for sustainable management 3: development of national standards for certification 4: some of area in project certified 5: over 80% of area in project certified
Carbon stock monitoring system established		0: not an objective/component 1: no action 2: mapping of forests and other land areas 3: compilation and analysis of carbon stock information 4: implementation of science based inventory/monitoring system 5: monitoring information database publicly available
Lifetime direct GHG emission avoided		tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emission avoided		tonnes CO2eq (see Special Notes above)
Lifetime direct carbon sequestration		tonnes CO2eq (see Special Notes above)
Lifetime indirect carbon sequestration		tonnes CO2eq (see Special Notes above)

Objective 6: Enabling Activities		
Please specify the number of Enabling Activities for the project (for a multiple country project, please put the number of countries/assessments)		
National Communication		
Technology Needs Assessment		
Nationally Appropriate Mitigation Actions		
Other		
Does the project include Measurement, Reporting and Verification (MRV) activities?		Yes = 1, No = 0