
United Nations Development Programme

**Ministry of Housing and Environment
Republic of Maldives**

**UNDP/GEF Project: Maldives – Renewable Energy
Technology Development and Application Project
(RETDAP)
(PIMS 2131)**

Final Evaluation Report

Mission Member:

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ABBREVIATIONS

Acronym	Meaning
ADB	Asian Development Bank
APEC	Asia Pacific Economic Cooperation Forum
APR	Annual Progress Report
AWP	Annual Work Plan
CCED	Climate Change and Energy Department (under the Ministry of Housing and Environment)
CER	Certified Emission Reductions
DANIDA	Danish International Development Agency
DPD	Deputy Project Director
DSM	Demand Side Management
EC&EE	Energy Conservation and Energy Efficiency
ELI	Efficient Lighting Initiative
EPC	Energy Performance Contract
ESCO	Energy Service Company
FE	Final Evaluation
FRESA	Fund for Renewable Energy System Applications
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GoM	Government of the Maldives
GWh	Gigawatt-hour
IDC	Island Development Committee
IEC	International Electrotechnical Commission
IMS	Information Management System
IPP	Independent Power Producer
kWh	Kilowatt-hours
LGF	Loan Guarantee Fund
MDG	Millennium Development Goals
MAA	Ministry of Atoll Development
MCST	Ministry of Communications, Science and Technology
MEA	Maldives Energy Authority (under the Ministry of Housing and Environment)
MED	Ministry of Economic Development
MEEW	Ministry of Environment, Energy and Water
MFT	Ministry of Finance and Treasury
MHTE	Ministry of Housing, Transport and Environment
MHE	Ministry of Industry and Trade
MPND	Ministry of Planning and Economic Development
MTE	Mid-Term Evaluation
NGOs	Non Government Organizations
NPD	National Project Director
NPM	National Project Manager
OTEC	Ocean Thermal Energy Conversion
PDF-B	Project Development Fund – Block B
PIR	Project Implementation Review
PM	Project Manager

Acronym	Meaning
PMU	Project Management Unit
QPR	Quarterly Progress Report
QWP	Quarterly Workplan
R&D	Research & Development
RETDAP	Renewable Energy Technology Development and Application Project
SMEs	Small and Medium Enterprises
SMILES	Strengthening Maldivian Initiatives for a Long-term Energy Strategy (EU project)
SREP	Sustainable Renewable Energy Program (World Bank/ADB-financed)
STELCO	Maldives State Electric Company (state-owned)
STO	State Trading Organization
TA	Technical assistance
TOE	Tonnes of Oil Equivalent
ToT	Training of Trainers
TCE	Tonnes of Coal Equivalent
TOR	Terms of Reference
UNDP	United Nations Development Programme
UN-ESCAP	UN Economic and Social Commission for Asia and the Pacific
WB	World Bank

EXECUTIVE SUMMARY

Background

Prior to 2005, there was no renewable energy development in the Maldives. The RETDAP project was formulated in 1999 to assist the GoM in the removal of barriers to the development of renewable energy (RE) resources such as solar, wind, biomass and biogas. RE resources would reduce the Maldives's foreign dependence on imported fossil fuels, contribute to its energy security, and reduce greenhouse gas (GHG) emissions, in line with the country's objective of mitigating climate change.

Three RE-related issues that provided rationale for RETDAP included:

- Exposure to price variations of imported fuels. The Maldives imports diesel for use in power generation. With the rising global price of diesel and other fossil fuels, efforts to reduce the country's dependence on diesel will be beneficial for the country's balance of payments;
- Rising electricity costs. When RETDAP was conceived in 1999, the Project was designed to reduce the high cost of electricity production in the Maldives. In addition to importing foreign fossil fuels, higher electricity costs are incurred from the additional costs of transporting these fuels to the 200 remote island communities, and the higher unit costs of electricity generation for mini-grids;
- Raising awareness of the impact of climate change from rising sea levels to the continued existence of the Maldives. The Maldives is a low-lying island nation that would be severely impacted from rising sea levels. By improving the ability of the Maldives to develop measures to mitigate climate change through renewable energy, it can undertake a leadership role to demonstrate the possibilities of reducing carbon emissions and improving energy security.

The project development **goal** is to reduce the annual growth rate of GHG emissions by increasing in the share of renewable energy generation in the Maldivian energy mix.

To achieve this goal, the Project was designed with a number of expected **project outcomes (revised as of September 2007)**:

- Outcome 1: Development of RE policies, laws and regulations that support the project goal;
- Outcome 2: Potential and feasibility of utilizing available RE resources in the Maldives are established;
- Outcome 3: Awareness of RE created and improved amongst users;
- Outcome 4: Understanding of RE technology amongst energy and equipment providers and decision-makers improved;
- Outcome 5: Increase in finance and financing mechanisms for RE-based energy projects;

- Outcome 6: Techno-economic feasibility of RET is established, and proposals for RE-based projects in the outer islands and atolls¹ are developed.

Context and Purpose of the Final Evaluation

The purpose of the FE for this Project is to evaluate the progress towards the attainment of global environmental objectives, project objectives and outcomes, capture lessons learned and suggest recommendations on major improvements. The FE is to serve as an agent of change and play a critical role in supporting accountability. As such, the FE will serve to:

- promote accountability and transparency, and to assess and disclose levels of project accomplishments;
- synthesize lessons that may help improve the selection, design and implementation of future GEF activities;
- provide feedback on issues that are recurrent across the portfolio and need attention, and on improvements regarding previously identified issues; and,
- contribute to the GEF Evaluation Office databases for aggregation, analysis and reporting on effectiveness of GEF operations in achieving global environmental benefits and on the quality of monitoring and evaluation across the GEF system.

Assessment of Project Outcomes and Sustainability

The overall rating of the project results is marginally satisfactory (MS). This is based on the Project achieving its intended outcomes including:

- enabling the GoM to develop effective RE policies;
- establishing the potential and feasibility of utilizing available RE resources;
- the launching of a highly visible solar-diesel hybrid pilot project on Mandhoo Island;
- the awareness raised on RE through the Mandhoo pilot project amongst government officers; and
- the successful piloting of a financial mechanism for RE through the setup of FRESA.

Factors that have hindered the project to meet all of its intended outcomes includes the lack of a strategic plan to create RE public awareness, and the absence of any programmes or activities to improve local RE technical capacity of entrepreneurs and policymakers. A summary of ratings for all outcomes is provided in Table A.

The overall Project sustainability rating is moderately unlikely (MU). This rating is primarily based on:

- The GoM policies to promote RE are in place. However, specific action plans are required to identify the resources and lead agencies to implement the strategies of the 2010 Energy Policy;

¹ An atoll is a coral island consisting of a reef surrounding a lagoon.

- Resources being in place for the continued collection of wind and solar data. However, there are no resources to collect data for ocean energy data even though there is an agreement signed with Robert Gordon University of Scotland for the collection of such data;
- The lack of any plan or resources to promote RE awareness in the Maldives;
- The lack of system, plan or resources to build local technical capacity for developing, maintaining and operating RE systems in the Maldives;
- The successful launching of FRESA, the revolving fund for financing RE systems, and the willingness of GoM officials to seek the means of re-capitalizing FRESA and sustaining its operations until 2020;
- The success of the Mandhoo Island solar-diesel hybrid system and the use of lessons learned from this pilot to design the current “Solar Maldives Program” that is being managed by the MHE.

Table A: Summary Assessment of Project Outcomes and Sustainability

Project Objectives	Intended End of Project targets (from re-constructed project planning matrix from 2007)	Outcome ² Assessment (Rel=Relevance, Eff=Effectiveness Efy=Efficiency Ov=Overall Rating)	Sustainability Assessment ³	Actual End-of-Project (EOP) Outcomes (as of 31 December 2011)
<p>Goal: Reduction in the annual growth rate of GHG emissions from the increase in the share of renewable energy generation in the Maldivian energy mix</p>	<ul style="list-style-type: none"> • Target installed capacity of RE in hybrid systems is 260 kW of installed capacity and RE energy production in other RE systems (biogas, other) • GHG reduction depends on actual operation of RE hybrid and other RE systems • % of RE in energy mix • Number and kind of RE market the project has transformed (hybrids, biogas, waste, SWH, etc.) 	<p>Rel – MS Eff - MS Efy - MS Ov – MS</p>	<p>Moderately Unlikely</p>	<ul style="list-style-type: none"> • Only 118.26 kW of RE hybrid systems has been installed by the Project • Direct GHG reductions are estimated to be 593 tons CO_{2eq} based on assumed RE generation from various pilot solar-diesel and solar-wind hybrid projects. Estimates of RE generation, however, were made by the Evaluator as there has not been any systematic monitoring of GHG emission reductions on these pilot RE projects • With only 118.26 kW of RE systems installed to date, RE comprises a negligible proportion of the country's energy mix • The project cannot claim transformation of the Maldivian RE market. While solar energy would qualify as having the best potential to transform the Maldivian energy sector, the number of solar projects financed

² *Highly Satisfactory (HS)*: The project has no shortcomings in the achievement of its objectives; *Satisfactory (S)*: The project has minor shortcomings in the achievement of its objectives; *Moderately Satisfactory (MS)*: The project has moderate shortcomings in the achievement of its objectives; *Moderately Unsatisfactory (MU)*: The project has significant shortcomings in the achievement of its objectives; *Unsatisfactory (U)* The project has major shortcomings in the achievement of its objectives; *Highly Unsatisfactory (HU)*: The project has severe shortcomings in the achievement of its objectives..

³ *Likely (L)*: very likely to continue and resources in place; *Moderately Likely (ML)*: model is viable, but funding or resources may not be in place; *Moderately Unlikely (MU)*: model is not viable or needs changing; and/or resources not in place; and *Unlikely (U)*: model is not viable and resources are not in place.

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				<i>from FRESA is too small to be characterized as transformative. However, the interest of the GoM in renewable energy (in particular, solar energy) is very high</i>
Outcome 1: Development of RE policies, laws and regulations that support the project goal	<ul style="list-style-type: none"> • Policy approved and implemented • Strategy and regulation to promote RE for community electrification (hybrids), individual (biogas, SWH) and waste-to-energy applications 	<p style="text-align: center;">Rel – HS Eff – MS Efy – S Ov – S</p>	Moderately Likely	<ul style="list-style-type: none"> • A 2006 Energy Policy was promulgated, a direct result of RETDAP assistance. A subsequent 2010 Energy Policy was also formulated without direct assistance of RETDAP. The contents of the 2010 Energy Policy, however, relied considerably on RE project materials and demonstration experiences from RETDAP • The 2010 Energy Policy contains strategies and guidance for the formulation and enforcement of regulations to promote RE for island community electrification
	<ul style="list-style-type: none"> • Energy Department adequately staffed • Energy supply and demand survey • Integral least-cost assessment of conventional and RE technologies (proposed) • Regularly updated energy 			<ul style="list-style-type: none"> • The departments in charge of energy related issues are within the Ministry of Housing and Environment, and are chronically short staffed. This includes the Climate Change and Energy Department (CCED) and the Maldives Energy Authority (MEA) • Energy supply and demand surveys for

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	<p>balances</p> <ul style="list-style-type: none"> • Energy policy approved and implemented • Studies completed, RE strategy formulated and national workshops held • RE targets integrated into 7th National Development Plan 			<p><i>2006, 2008 and 2009 were completed and compiled into a Report on “Energy Demand and Supply for the Maldives”</i></p> <ul style="list-style-type: none"> • <i>A preliminary financial assessment of solar PV investments on small islands was completed by the Climate Change and Energy Department in 2011. The assessment was a government initiative that relied on the experiences of solar PV demonstrations supported by RETDAP</i> • <i>Energy balances were updated for 2006, 2008 and 2009</i> • <i>The 2010 Energy Policy is now approved but in need of action plans to implement the Policy</i> • <i>RE strategy developed in the 2006 and 2010 Energy Policy. RETDAP-supported national policy workshops were held in 2005</i> • <i>RE target expressed in the 2020 Carbon Neutrality plan and in recent speeches made by the President where 60% of the RE by 2020 will be from solar⁴</i>

⁴ <http://www.presidencymaldives.gov.mv/Index.aspx?lid=13&dcid=5983>

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Outcome 2: Potential and feasibility of utilizing available RE resources in the Maldives are established	Comprehensive RE resource database expanded with biomass and ocean energy potential assessments	Rel – S Eff – S Efy – S Ov - S	Moderately Likely	<ul style="list-style-type: none"> RE resource data for 4 wind stations and one solar station (at Hulhule) compiled. No comprehensive data generated for marine currents or OTEC for energy production although the issues were studied in 2010 by the Robert Gordon University of Aberdeen Scotland
	<ul style="list-style-type: none"> More detailed biomass assessment in atoll/island groups and studies on OTEC and marine waves Staff has been adequately trained on solar and wind measurements as well as on biomass and waste assessment About 30% of trained staff is involved in providing training 			<ul style="list-style-type: none"> A number of RE assessment studies were undertaken including: i) a 2009 biomass resource assessment for inhabited and uninhabited islands as well as a separate assessment for Male; ii) estimates of landfill gas generation at the Thilafushi landfill; iii) estimates for gas generation using a biogas digester from Guarantee Fiberglass Fabrication in Male; iv) a 2011 assessment of the use of marine currents and OTEC for energy production by the Robert Gordon University of Aberdeen Scotland Staff at the Department of Meteorology were trained in the use and maintenance of equipment for collecting wind and solar data. There has been no such training for biomass and waste

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				<ul style="list-style-type: none"> The number of trained staff to provide training is not known
Outcome 3: Awareness of RE created and improved amongst users	Fully functioning RE information centre cum one stop-shop, continuing the education and awareness enhancement initiated under RETDAP	Rel – MS Eff – MU Efy – U Ov – MU	Unlikely	<i>RE information center was operational in 2009. The Center only functioned as a distribution center for RE promotional material. The Center did not survive beyond 2008 when the Project executing agency changed from MEEW to MHTE in 2008 and from MHTE to MHE in 2010</i>
	<ul style="list-style-type: none"> Fully functioning RE Center established and functioning that provides one-stop-shop services (to about 40 clients annually), collects and disseminates information in printed and electronic form, circulates a RE newsletter, organizes technical and other trainings on RE and gathers data on ongoing RE activities in Maldives Product exhibition Awareness creation activities and technology demonstration in OIA Media and communication action plan 			<ul style="list-style-type: none"> RE information center is no longer operational as of late 2009 While no RE product exhibition was held, RE demonstrations were held in various islands such as Mandhoo Island which raised public awareness of the feasibility of setting up RE projects throughout the Maldives Awareness activities consisted of project personnel advising interested stakeholders on where to seek financing for RE projects and supporting two Provincial workshops with school children in 2009 A media and communication action plan was prepared in 2006

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Outcome 4: Understanding of RE technology amongst energy and equipment providers and decision-makers improved	<ul style="list-style-type: none"> Assessment of RE technology support system and recommendations Comprehensive training course established (in coop. with Maldivian educational institutes) on RE feasibility and management as well technical training (design, installation, maintenance and operation) 	<p>Rel – U Eff – U Efy – U Ov – U</p>	Moderately Unlikely	<ul style="list-style-type: none"> <i>There is no assessment of RE technology support systems. As a result, no plans and strategies were developed for building technical capacities in the Maldives for installing, operating and maintaining RE equipment</i> <i>No comprehensive training courses on RE feasibility, management, design, installation, operation and maintenance have been developed</i>
	<ul style="list-style-type: none"> Assessments carried out on viability of local RE consultancy and engineering services and local manufacturing of components Plan formulated to enhance capacity of RE technology support system (solar & wind hybrids, biogas, waste, SWH, biomass) Trained staff from MEEW, other government entities and private sector (on-the-job, seminars, study tour) Annual training course on RE At least 50% of trained staff are involved in RE management, 			<ul style="list-style-type: none"> <i>No assessments on the viability of RE consultancies, engineering services and local manufacturing done by the project. Assessments of RE investments were only conducted as a part of the due diligence process for loan approvals by FRESA</i> <i>No plan prepared for improving local technical capacity for RE technologies</i> <i>Government and private sector personnel have received training on solar diesel hybrid projects (2006), attended RE and EE seminars and study tours to Malaysia and Thailand (2006), received more training on solar and biomass projects (2007) and biogas digesters (2008), and attended</i>

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	operation or installation <ul style="list-style-type: none"> Proposals for RE projects in OIA 			<i>seminars (along with resort personnel) on RE and energy conservation (2007). The number of trained personnel still in government positions is unknown</i> <ul style="list-style-type: none"> A syllabus for “renewable energy systems and maintenance” was developed by the Faculty of Engineering at Maldives Polytechnic in 2008. However, no annual training courses are in place to deliver the course. The barrier to conducting the training course is the availability of qualified personnel to deliver RE training in the Maldives; RETDAP has been unable to engage any national or international consultants to assist in the delivery of this training No trained staff on RE management, operation or installation resulting from RETDAP activities There are a number of proposals for RE projects including the “Solar Maldives Program” as well as a few foreign private sector companies from India and China
Outcome 5: Increase in finance and financing mechanisms for	<ul style="list-style-type: none"> The RE Centre at MEEW processes about 40 	Rel – HS Eff – MS	Moderately Likely	<ul style="list-style-type: none"> The Bank of Maldives in close collaboration with the MHE have

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RE-based energy projects	<ul style="list-style-type: none"> applications Provision of FRESA financing to approved applicants 	<p>Efy – S Ov – S</p>		<p><i>processed over 6 applications for RE financing for FRESA of which 4 loans (averaging around USD 60,000) have been disbursed to entrepreneurs for RE financing</i></p> <ul style="list-style-type: none"> <i>FRESA has approved and provided RE financing to 4 applicants</i>
	<ul style="list-style-type: none"> Training courses conducted for private and government financial institutions; commercial banks; and private entrepreneurs Clear and well-defined mechanics and target groups of the FRESA financing scheme and legal status established FRESA established Exit strategy for FRESA for post-RETDAP period defined 			<ul style="list-style-type: none"> <i>Training on RE project finance was provided in 2007 for personnel from the Bank of Maldives and selected entrepreneurs. Training for credit officers was provided in 2010. Evaluation of the technical feasibility of loan applications was provided by external technical consultants</i> <i>Legal status of FRESA was established in 2007. Target groups identified in the November 2006 FRESA guidelines ranged from private households to private corporations and SMEs</i> <i>FRESA was established in 2008</i> <i>Exit strategy for FRESA in a post-RETDAP regime was prepared in December 2011</i>
Outcome 6: Techno-economic feasibility of RET is established, and proposals for RE-based	<ul style="list-style-type: none"> Installation of at least 260 kW RE in hybrid systems Installation of household biogas 	<p>Rel – S Eff – MS Efy – MU</p>	Moderately Likely	<ul style="list-style-type: none"> <i>Only 118 kW of RE hybrid systems has been installed as a direct impact of RETDAP assistance including 12 kW</i>

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projects in the outer islands and atolls are developed	systems <ul style="list-style-type: none"> Plans for other RE systems (biomass, SWH, waste-to-energy) 	Ov – MS		<i>of solar-diesel hybrid at Mandhoo Island, 8 kW of solar-wind hybrid at Fainu Island, and 3 other solar-wind-diesel hybrid projects executed by Maldives Gas wind hybrid systems on Uligan, Raiymandhoo and Kondey Islands</i> <ul style="list-style-type: none"> Five household biogas systems were tested Various plans for other RE systems developed
	<ul style="list-style-type: none"> Surveys and baseline analysis on these and selected other Islands Installation of hybrid systems in various islands with a total capacity of 260 kW At least 5 biogas digesters installed and operational A total of X potential livelihood support and productivity projects are proposed and evaluated Plans for installation of hybrid systems in 100 islands Plans for development of other RE sources (e.g., biomass, waste-to-energy) 			<ul style="list-style-type: none"> Surveys and baseline studies for the use of biomass and solar as a resource as contained in the "Report on Energy Supply and Demand 2008-09". Wind resource availability also surveyed for selected islands in 2005 and 2006 Plans for 118 kW of RE hybrid systems completed and implemented Three bio-digesters were developed by RETDAP in early 2009 in partnership with a local firm, Guarantee Fibreglass Fabrications. These bio-digesters are reportedly operational today. Another 2 bio-digesters were developed in late 2009 in collaboration with UNIDO. Second hand reports from users

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				<p><i>indicate that these bio-digesters are currently not operational.</i></p> <ul style="list-style-type: none"> • <i>One “livelihood and support” program has been proposed by UNDP, namely the “Maldives Low Emission Climate Resilient Development Programme”. The goal of the program is to support communities in Laamu Atoll increase their resilience to climate change, through green and inclusive development and increased energy security</i> • <i>The GoM has plans in place for the development of solar-diesel hybrid projects on 29 islands under the “Solar Maldives Program” (launched in 2011). The Program has a target of 20% energy demand being achieved from solar on these islands with current budget allocations over the next year sufficient to install less than 1.0 MW on 6 islands. Project designs will be based on lessons learned from the Mandhoo Island pilot. The GoM’s overall solar RE target is 60% generation for the country.</i>

Replicability or Catalytic Role of Project

Early activities of RETDAP were instrumental in catalyzing RE policy formulation and RE development in the Maldives. However, the lack of a full-time RETDAP project manager reduced prominence of RETDAP after 2008; this was a primary factor contributing to the country's poor local RE technical capacity and general lack of public awareness on RE. These deficiencies will constrain the growth of RE opportunities in the Maldives.

RETDAP has also resulted in the mobilization of donor resources and private sector initiatives for RE development including:

- bilateral resources from USAID (SARI/Energy project), DANIDA (Atoll RE Development being managed under the One UN Trust Fund) and JICA (Clean Energy Promotion Project in Male);
- the World Bank/ADB SREP project;
- the 600 kW waste-to-energy (WTE) project by an Indian company to gasify municipal solid waste from the Thilafushi landfill; and
- a proposal from a Chinese company for the development of a 50 MW wind power project near Male

M&E During Project Implementation

Two versions of the RETDAP log-frame were used, the first one in 2004 and the second one in 2007. Keeping in mind that these log-frames were designed in 1999 in the absence of any baseline energy data, project personnel were essentially forced into “guessing” end-of-project (EOP) targets, which create the optics of being poorly defined or overly ambitious.

Ratings of the Project's Monitoring and Evaluation system¹⁷ are as follows:

- *Quality of M&E design – MU.* The targets of the log-frame for RETDAP (both in 2004 and 2007) required more clarity (considering the lack of baseline information) and more realistic targets;
- *Quality of M&E implementation – MU.* This rating is a direct result of the quality of the log-frame, the resulting difficulties in determining required concrete actions, and the subsequent lack of detailed reports of various activities

One of the outcomes of RETDAP should have been a monitoring, reporting and verification (MRV) system that can monitor the long-term effectiveness of RE development in the Maldives. However, no such system is in place. The setup of an RE information system and database for this purpose is highly recommended. Such a system would vastly improve the country's MRV capacities to report GHG reductions and increase the likelihood of monetizing Maldivian emission reductions to the carbon markets such as the EU-ETS.

¹⁷ HS or Highly Satisfactory: There were no shortcomings in the project M&E system;
 S or Satisfactory: There were minor shortcomings in the project M&E system,
 MS or Moderately Satisfactory: There were moderate shortcomings in the project M&E system;
 MU or Moderately Unsatisfactory: There were significant shortcomings in the project M&E system;
 U or Unsatisfactory: There were major shortcomings in the project M&E system;
 HU or Highly Unsatisfactory: The Project had no M&E system

Assessment of Processes Affecting Attainment of Project Outcomes and Sustainability

Preparation and Readiness:

RETDAP used a project design prepared in 1999 without the benefit of PDF funds to collect baseline information; as a result, the Project log-frame was never fully developed. Despite this shortcoming, the project did successfully demonstrate RE projects and a revolving RE fund mechanism, as well as raise RE awareness amongst government officials in the Maldives.

Up to 2007, the MCST/MEEW had provided good management of RETDAP activities. However, after 2007, a number of changes were made by the GoM in counterpart project personnel. This resulted in a lack of continuity in project management from 2007 to 2010, a critical period during which the project could not successfully achieve its objectives of building public awareness and local RE technical capacity.

Country Ownership and Drivenness:

Since 2006, sustainable energy planning has become a mainstay of GoM development policy. This was reflected as early as the 6th National Development Plan that guides stakeholders “to plan and manage the provision and utilization of energy and the supply of electricity in the country” and “to minimize the dependency on imported sources of energy for generating power”. More recent demonstrations of the drivenness and commitment of the Government includes the 2010 Energy Policy and Strategy (where RETDAP and the SMILES project resources were instrumental in its formulation); the 7th National Development Plan (2009-13) that envisages a 10-12% target share of RE in the energy supply mix; and vision of carbon neutrality by 2020 (also stated in the 2010 Energy Policy and Strategy).

The drivenness of the GoM, however, is somewhat tempered by its chronic staffing shortages limiting the pace of RE development. As such, the GoM will likely continue to need assistance to advance its progress towards the goal of carbon neutrality by 2020.

Stakeholder Involvement:

Involvement of decision makers in government, notably the Deputy Minister of Energy as the Project Director between 2005 and 2007, was a key factor to good progress attained by the Project during this period. High staff turnover and frequent changes in the GoM implementing partner between 2007 and 2010, however, resulted in declining government involvement and less prominence of RETDAP activities. This became an inhibiting factor to achieving public awareness and local technical capacity outcomes. By 2009, RETDAP management was stabilized with the assignment of three key government officers. However, by 2009, more than 88% RETDAP technical assistance resources¹⁸ had been expended limiting minimal government options to complete the Project.

¹⁸ “TA resources” is the total RETDAP budget less the USD 250,000 seed capital for FRESA.

The Project, however, has been instrumental in attracting the interest of six private sector entities through FRESA (of which four received approved loans). These entities were mainly entrepreneurs seeking opportunities to setup businesses in supplying and setting up RE equipment in the Maldives. While the Project increased the involvement of state entities into RE, the involvement of the private sector could have been improved if FRESA had been properly promoted. Project resources could have also been used to increase the involvement of the tourism sector in RE development; this probably would have resulted in raising the profile of RE development in the Maldives.

Based on 2011 estimates by SREP that 25% of RE projects are not operational, there appears to be minimal involvement of end users in RE in island communities. Building local RE technical capacity is extremely important if RE generation on island communities is to be sustained; as such, there is an immediate need for a program to build capacity to service RE projects in island communities.

Financial Planning:

While RETDAP was planned as a 3-year project, financial planning was required for a 7-year period. Much of this was due to the late start-up of FRESA, which started in earnest in 2008 but was not completed until 2011 (due to lack of borrower interest). In addition, the need for assistance in RE policy development deferred Outcome 1 expenditures to 2008 and 2009. Notwithstanding the lack of a full-time Project Manager, delays in project completion added to project management costs estimated to be around 20% of the total project cost. Technical assistance expenditures from Outcomes 1 to 6 comprised 46% of the Project's expenditures while the FRESA fund of USD 250,000 accounted for 33% of the total Project expenditures.

Supervision and Backstopping by UNDP:

Supervision and backstopping efforts by UNDP Maldives and the UNDP-GEF Regional office in Bangkok were marginally satisfactory. One area where RETDAP would have benefited from more UNDP supervision was completion of quantification deficiencies in its log-frame. As such, a well-prepared log-frame would have improved the performance of the M&E aspects of the project. However, the difficulties of recruiting a full-time Project Manager during the 2007 to 2010 period only added to the difficulties of UNDP in supervising this project.

Co-Financing and Delays:

The Project co-financing amounts were estimated to be in the order of USD 2.849 million, roughly four times the GEF allocation.

RETDAP experienced a number of delays in implementation since the Prodoc was signed in July 2004:

- The tsunami of December 2004 delayed the start-up of RETDAP to July 2005;
- The implementing agency was changed four times during the course of the 7-year project;
- Six project managers served on RETDAP. Each PM change was accompanied by several months of slow progress including a familiarization period with the project. With chronic staffing shortages, civil servants assigned to the Project

after 2008 were also tasked with managing other RE initiatives that were being started by the GoM and other donor agencies. As such, downstream RETDAP activities such as building public awareness and local technical RE capacity were neglected leading to the failure of these activities to achieve their outcomes. This resulted in minimal government time and support to the project and delays to conclude the project;

- The slow start of FRESA from 2008. When FRESA became operational in 2008, no loans were approved due to high interest rates and poor promotion of the fund. In 2009, lower interest rates catalysed more loan applications. High administrative efforts, however, to approve the loans only delayed completion of the project until 2011 during which the fourth and final loan was approved by the FRESA Board.

Lessons Learned

- The importance of obligating an RE equipment supplier to provide technical support for a project after installation. RETDAP had delivered strong technical assistance in identification of appropriate technologies, determination of energy savings, cost estimation, sourcing appropriate equipment and expertise, and installation of RE technologies, much of this through “learning-by-doing”. Based on the experiences of RETDAP demonstrations, most importantly, the Mandhoo Island solar-diesel hybrid pilot demonstration, a key lesson learned was the need to have an RE supplier provide technical support in the event of equipment malfunction. Supply and installation of the solar facility should have been contingent on an O&M plan and technical support for a set number of years after completion of the project. Technical support should continue until knowledge transfers of the solar facility to local residents and a large central institution such as STELCO in Male are complete;
- The importance of data collection and analysis for RE projects. RETDAP did not develop any systems for the collection of baseline energy data and data of renewable energy generated. Long-term collection of energy data is extremely important as it provides more confidence to potential investors and project developers on the viability of RE investments. In addition, monitoring RE generation will also provide confidence of the economic and GHG reduction impacts of RE investments;
- Thorough preparations are required for the successful operation of a RE revolving fund: This would involve:
 - *identification of target groups with incentives to apply for loans.* In the case of RETDAP, FRESA revolving funds were initially targeted for RE investments by private households who did not have any incentives to convert to RE. An improved approach would have been to have FRESA funds financing specific RE technologies to meet government RE targets (e.g. 10% solar by 2015);
 - *availability of loan preparation assistance for borrowers.* Credit officers knowledgeable on RE technologies should have been trained to assist potential borrowers in preparing applications, advising them of procedures and eligibility requirements (notably on the types of technologies that can be financed) and repayment terms;

- *ensuring the revolving fund has sufficient resources* to cover banking administrative costs; to raise public awareness of the existence of the fund; and for turnover of a sufficient number of projects to raise the profile of RE technology deployment in the country;
- ***Pilot projects must be holistically designed and managed.*** An appropriate design and implementation process was conducted for the Mandhoo Island solar-diesel hybrid pilot. This would include technology identification and sourcing appropriate expertise (long-term), estimation of capital costs and financial analysis (that included O&M), energy savings and building local capacity by allowing local residents to install the system. The pilot also demonstrated the need for dedicated O&M personnel to sustain generation of RE;
- ***The successful launch of a national RE program requires:***
 - a thorough assessment of stakeholders and their commitments towards the project (expressed in terms of co-financing);
 - a proper assessment of local capacity and absorption for new technologies and practices, and the design of an appropriate RE capacity building program;
 - the promotion of RE technologies that have significant economic advantages to its users. This was not the case prior to 2008 when fossil-fuel generated electricity was more competitive than RE.

Recommendations

Recommendations of this Final Evaluation are aimed at assisting the GoM in meeting its carbon neutrality targets for 2020:

Recommendation 1: Provide a detailed strategic plan to implement the Energy Strategy that contains prioritized actions with timelines and financing requirements. In the opinion of the Evaluator, the detailed strategic plan needs to include rapid development of RE projects to provide the critical momentum towards achieving carbon neutrality. The strategic plan should:

- promote solar and wind resources for electricity generation as best RE options at this stage due to lower costs of the equipment, the availability of solar and wind¹⁹ resources throughout the Maldives and the relative simplicity of operating these technologies. One major technical issue that remains is storing solar power for night use; currently battery banks are not only expensive but also environmentally costly. The GoM should seek foreign technical assistance to find appropriate and economic technologies for storage of grid solar power for night use. This would include promising long-term energy storage technologies that may become commercialized over the next 5 years including lithium-ion batteries, flow batteries and flywheels;
- establish the feasibility of household biogas digesters in the Maldives. Waste-to-energy (WTE) solutions were found to be feasible only in cases where the waste

¹⁹ Wind energy for the Maldives can be mainly harnessed from the northern atolls with average wind speeds at 50 m height ranging from 4.0 to 8.3 m/s based on wind resource data collected from SMILES activities between 2003 and 2005. A number of wind energy projects are being proposed by the private sector in the Maldives, notably the 50 MW Hulhumale Project (near Male) by the Chinese wind company XEMC.

- streams exceeded 15 tons per day²⁰. The concept of forming a cooperative where one digester serves a number of households should be investigated and scaled up if there is an economic advantage (after removal of fuel subsidies), sufficient TA funding to assist in deployment and community interest;
- provide details of how the government will utilize foreign assistance to overcome barriers to RE implementation. This would include actions to:
 - improve local capacity to assess, plan, implement and monitor RE development in the Maldives. This would include the setup of training facilities for trainers, RE engineers, project managers and auditors;
 - resolving lack of institutional clarity on the roles and responsibilities of promoting and implementing RE projects. At this time, much of the RE technical and implementation expertise in the Maldives appears to lie with the MHE, and its subordinate companies STELCO and Maldives Gas (see Recommendation 2 below);
 - strengthening and re-capitalization of FRESA to improve rate of adoption of RE technologies. The re-capitalization of FRESA is a requirement if it is to evolve into a “one-stop facility” where viable RE technologies (that are sold by local RE entrepreneurs or foreign technology suppliers) can be promoted, and assistance provided to potential users to efficiently access financial resources.

Recommendation 2: Strengthen the institutional arrangements for Renewable Energy. The main issue in the institutional arrangement is the lack of incentive for personnel managing island utilities to reduce fossil fuel usage through renewable energy. To improve the adoption of renewable energy in the Maldives, the following actions are recommended:

- Prepare and implement a strategy that consolidates a fragmented power sector consisting of over 250 utility entities on 200 islands. Recent initiatives by the GoM have commenced a process of consolidating the power sector with the establishment of six regional utilities in addition to STELCO to provide electricity and other services including water and sewage. With the deployment of new technologies such as solar panels and inverters, an institution such as STELCO needs to be positioned as a national technology champion for renewable energy technologies (see Recommendation 3 on capacity building of STELCO). Their role can evolve into assisting island communities in the baseline data collection of power generation from diesel fuel on the islands; design and installation of solar equipment and other renewable energy technologies as deemed economical and appropriate; provision of operational assistance and technical support; and building local capacity to manage new hybrid generation facilities;
- Reform the Maldives Energy Authority (MEA) to more effectively regulate the energy sector towards carbon neutrality. Although the MEA is mandated to regulate the Maldivian energy sector, in practice, it only regulates the activities of STELCO and the six new regional utilities. MEA in its current form lacks the proper regulatory framework and legal mandate to effectively regulate the entire Maldivian energy sector as it transitions towards carbon neutrality;
- Set up an energy monitoring cell within MEA (under MHE) to monitor RE installations and resulting GHG reductions. This may involve setting up of data loggers within

²⁰ Environmental Research Center 2007

power generation facilities of each island utility. To save on costly travel to the various islands to collect data, a real-time web-based data collection system can be set up in collaboration with the island communities. Such a system can provide important operational information that can be used to manage and troubleshoot remote RE projects as well as inform RE policy and potential RE investors. The system can also be used to demonstrate the commitment of the GoM to improving MRV systems for GHG monitoring. The local administration can manage the collection of energy information for the island that reports to a central government authority that reports to the monitoring cell and STELCO;

Recommendation 3: Build technical capacity to support project activities towards the goal of carbon neutrality by 2020: Technical assistance is required to:

- assist the Government of Maldives in formulating investment plans and proposals for foreign aid to facilitate investments and support in alternative energy projects in the Maldives²¹. With several new renewable energy and energy efficiency technologies being passed through various government departments, technical assistance is required to evaluate and accept RE proposals that are most appropriate for the Maldives in its quest to become carbon neutral by 2020;
- set up national standards for RE technologies and projects. Under a reformed MEA, minimal standards for RE generation using solar, wind and biomass resources needs to be set. This could include ISO standards or standards for solar and other renewable technologies under IEC. In addition, there should also be contractual standards set for RE equipment installation contractors that defines their scope of services, payment modalities and arbitration rules;
- strengthen STELCO capacity as national technology champion on RE for island grids. Using the syllabus developed under RETDAP for the Polytechnique course on “Renewable Energy Systems and Maintenance”, STELCO trainers can be trained on the design, installation, operation and maintenance of renewable energy systems, as well as O&M of small grids. These STELCO trainers, in turn, can then provide in-country training of other utility technicians in the Maldives, notably communities outside of Male. Currently, there are no such training courses in the Maldives;
- improving national MRV capacity for GHG monitoring. Technical assistance should be provided to MEA (under MHE) to improve their monitoring, reporting and verification capacities on diesel fuel consumption and offsetting renewable energy generation.

Recommendation 4: Financing future RE projects through a re-branded FRESA:

This would entail the continuation of FRESA as a self-standing fund with improved procedures. This would essentially consist of improving the current operational procedures of FRESA in line with previous concerns of the need to significantly recapitalize and increase FRESA funds. One possibility that will require further

²¹ In May 2011, the Cabinet announced it would establish a Renewable Energy Investment Office (under the Ministry of Economic Development) to formulate economic solutions to improve energy security of the Maldives concerns and expedite implementation of these solutions. In addition, this office will find and apply appropriate alternative energy solutions and assist regional utility companies in seeking investments and capacity building in the area of renewable energy technologies. The Evaluator notes, however, that there are officers within the chronically understaffed MHE who have excellent RE technical capacity and are managing the GoM-funded “Solar Maldives Program”. Hence, future technical assistance programs will need to identify the appropriate agencies for capacity building.

assessment is linking FRESA with the Laamu Atoll Development, a UNDP-project initiative funded by DANIDA. Since one-third of this project's funds are for renewable energy development, a portion of these funds could be used to re-capitalize FRESA²².

FRESA design and operational procedures will also need to be improved to:

- ensure there are sufficient resources for fund promotional activities;
- provide technical assistance for borrowers;
- lend primarily to entrepreneurs to develop the local “green” industry that will contribute to economic growth and generate new employment in the area. With the development of this domestic industry in the areas of renewables, energy efficiency and waste management technology, valuable expertise can be developed for the maintenance and repair of these technologies;
- link with the MEA monitoring cell and its improved MRV capacity to report on the Fund's achievements in GHG reductions on its RE and EE loans; and
- serve as a vehicle to attract other sources of capitalization. This would include climate funds, Gold Standard carbon credits, and philanthropy. The GoM can even consider diversion of diesel fuel subsidies and the deposit of green taxes on resorts and other tourism sector transactions such as souvenir sales, merchandise and diving schools.

Recommendation 5: Provide assistance on determination of best technologies for small island grids to become carbon neutral. With improvements in battery technology expected over the next few years, the GoM should be apprised of such developments should they become more cost effective. This would include promising long-term energy storage technologies that may become commercialized over the next 5 years including lithium-ion batteries, flow batteries and flywheels.

Recommendation 6: Improve participation of the tourism sector in RE development. To date, the involvement of the island resorts in RE development has been minimal. Given that the tourism sector consumes more than 32% of the country's primary energy resources, the GoM needs to have a collaborative approach with the industry to contribute to the vision of carbon neutrality by 2020. A pilot project to implement RE development for a selected resort may be the catalyst required for RE development in the sector. Moreover, marketing of carbon neutral resorts could accelerate the rate of RE adoption by all resorts in the Maldives.

²² Equilibrium Consulting GmbH, “Evaluation of FRESA (Fund for Renewable Energy System Applications)”, 12 December 2011

1. INTRODUCTION

This report summarizes the findings of the Final Evaluation Mission conducted during December 2011 for “Renewable Energy Technology Development and Application Project (herein referred to as the “Project” or RETDAP implemented by the United Nations Development Programme (UNDP), PIMS 2131 and with financing support provided by the Global Environment Facility (GEF). The Project Document (Prodoc) of 2004 provides details to remove key barriers to renewable energy investments in the Maldives. RETDAP field operations commenced in November 2004 with the Inception workshop. The Project was designed as a 3-year project. The Project was completed on December 31, 2011.

1.1 Background

1.1.1 Overview of the Energy Sector of the Maldives

The Maldives is an archipelago of 1,190 islands over an area of more than 100,000 km². The population of the country is 316,000 spread over 190 of these islands. Male is the capital city with a population of over 100,000 on a 2-km² island. Since the early 1970s, the Maldives diversified its economy with the development of its tourism industry that now accounts for more than 30% of its GDP. The sustained stream of foreign currency from this sector into the Maldivian economy has allowed the country to achieve its goal of 100% electrification. Despite experiencing a negative growth rate of 5.5% after the 2004 tsunami, the Maldivian economy has continued to grow to the extent that the Maldives has graduated from Least Developed Country (LDC) status as of January 1, 2011²³.

With their negligible contribution to global greenhouse gas emissions, the Maldives is also symbolic as one of the first countries to be impacted by climate change, namely rising sea levels. In 2009, the Government of Maldives (GoM) declared its intention of becoming carbon neutral by 2020. This declaration was driven by two main factors:

- The need to demonstrate international leadership that low-carbon growth is possible and that a country can become carbon neutral; and
- The need to reduce its dependence on imported fossil fuels that generate more than 80% of the Maldives’ emissions. With the spike in global fossil fuel prices in 2008, the country’s energy expenditure in 2010 was over USD 240 million comprising 16% of the country’s GDP. In a business-as-usual scenario, the reliance of the Maldivian economy on costly imported fossil fuels is widely viewed as an impediment to further national development. Implementation of a carbon neutral plan can only assist the Maldives in achieving greater energy security.

The Maldives today, however, is almost completely dependent on the import of fossil fuels for power generation. In 2009, the Maldives consumed more than 340,000 tons of oil equivalent (TOE). This translates into 1.3 million tonnes of CO_{2eq} that is expected to rise to 2.5 million tonnes of CO_{2eq} by 2020²⁴. Out of the 340,000 TOE, more than 82% or 280,000 TOE was diesel fuel.

²³ <http://www.unctad.org/Templates/WebFlyer.asp?intItemID=5810&lang=1>

²⁴ <http://cbr.groupedtr.ch/common/medias/?uid=maldives-carbon-audit>

The development of the Maldivian energy sector has been hampered by the small physical size of the majority of the over 200 inhabited islands, all of which have their own mini-grid systems as opposed to one national power grid. Each island has its own independent powerhouses & electricity distribution networks. Most inhabited islands have electricity providers such as “Island Development Committees” (IDCs) or Independent Power Producers (IPPs) that operate diesel fuel-driven generators with installed capacity ranging from less than 100 kW to 3 MW. Resort islands operate their own captive systems.

At present, nearly all electricity production is based on diesel generators with the exception of a few renewable energy applications. The cost of electricity generation in the Maldives is \$0.30 to \$0.40 per kWh, high in comparison to other countries in the region, in part due to:

- added cost of transporting fuels to remote islands;
- the small-scale generation systems that service low density populations on scattered islands; and
- poorly operated and maintained systems where more diesel fuel is consumed per kilowatt-hour generated.

The total installed capacity for electricity production in the Maldives is estimated to be around 217 MW of which 62 MW is in Male’, 100 MW for the more than 97 resorts and 55 MW for the remainder of the country. A further breakdown of 2009 diesel consumption shows that almost 42% of the diesel fuel imported was used for production of electricity in resorts, 33% was used for electricity production by STELCO, the national utility, and the remaining 25% was converted to electricity in local islands and for industrial purposes. Electricity production is decentralized and based on production units of various sizes. Each of the 200 inhabited islands of the Maldives has its own separate electricity generation system based on diesel generators and distribution system providing services to its residents. All 97 resorts registered in the Maldives as of 2010 have private electricity production.

1.1.2 Development of the Renewable Energy Sector in the Maldives

There is general agreement that electricity demand in the Maldives will grow, further constraining the development of the country. The recent report on “the Framework for Energy Investment in the Maldives” estimates electricity demand in the Maldives will grow by 8% in 2020²⁵ (PWC, 2011). The Carbon Audit Report of 2009 for the Maldives predicts the doubling of electricity demand by 2020²⁶.

Renewable energy (RE) is a key part of the Maldivian development strategy as early as the Sixth National Development Plan (2001-05) that stated the need for:

- exploring possible sustainable sources of energy for power generation and desalination;
- strengthening policy-making and regulatory bodies in the energy sector and formulating an energy policy;

²⁵ Pricewaterhouse Coopers 2011

²⁶ <http://cbr.groupeadr.ch/common/medias/?uid=maldives-carbon-audit>

- training of technical personnel at all levels for the energy sector, especially for the Atolls; and
- conduct awareness regarding fuel consumption and sustainable use of energy sources;
- ensuring the equitable sharing of the benefits of development among the Maldivian population while considering the constraints/limitations of dispersed island communities.

Prior to 2005, there was no renewable energy development in the Maldives. The RETDAP project was formulated in 1999 to assist the GoM in the removal of barriers to the development renewable energy (RE) resources such as solar, wind, biomass and biogas. RE resources would reduce the Maldives's foreign dependence on imported fossil fuels, contribute to its energy security, and reduce greenhouse gas (GHG) emissions, in line with the country's objective of mitigating climate change.

Three RE-related issues that provided rationale for RETDAP included:

- Exposure to price variations of imported fuels. The Maldives imports diesel for use of power generation. With the rising global price of diesel and other fossil fuels, efforts to reduce the country's dependence on diesel will be beneficial for the country's balance of payments;
- Rising electricity costs. When RETDAP was conceived in 1999, the Project was designed to reduce the high cost of electricity production in the Maldives. In addition to importing foreign fossil fuels, higher electricity costs are incurred from the additional costs of transporting these fuels to the 200 remote island communities, and the higher unit costs of electricity generation for mini-grids;
- Raising awareness of the impact of climate change from rising sea levels to the continued existence of the Maldives. The Maldives is a low-lying island nation that would be severely impacted from rising sea levels. By improving the ability of the Maldives to develop measures to mitigate climate change through renewable energy, it can undertake a leadership role to demonstrate the possibilities of reducing carbon emissions and improving energy security.

1.2 Project Goals, Objectives and Expected Results

The project development **goal** is to reduce the annual growth rate of GHG emissions by increasing the share of renewable energy generation in the Maldivian energy mix.

To achieve this goal, the Project was designed with a number of **project outputs and outcomes**:

- Outcome 1: Development of RE policies, laws and regulations that support the project goal;
- Outcome 2: Potential and feasibility of utilizing available RE resources in the Maldives are established;
- Outcome 3: Awareness of RE created and improved amongst users;
- Outcome 4: Understanding of RE technology amongst energy and equipment providers and decision-makers improved;

- Outcome 5: Increase in finance and financing mechanisms for RE-based energy projects;
- Outcome 6: Techno-economic feasibility of RET is established, and proposals for RE-based projects in the outer islands and atolls are developed.

Section 2 will provide more detail on the achievements to date of the project's outcomes and outputs.

1.3 Final Evaluation

1.3.1 Purpose of the Evaluation

For all UNDP projects funded by GEF, a final evaluation (FE) is required after completion of a project to provide a comprehensive and systematic account of the performance of the completed project by evaluating its design, process of implementation and achievements vis-à-vis GEF project objectives and any agreed changes during project implementation. As such, the FE for this Project will serve to:

- promote accountability and transparency, and to assess and disclose levels of project accomplishments;
- synthesize lessons that may help improve the selection, design and implementation of future GEF activities;
- provide feedback on issues that are recurrent across the portfolio and need attention, and on improvements regarding previously identified issues; and,
- contribute to the GEF Evaluation Office databases for aggregation, analysis and reporting on effectiveness of GEF operations in achieving global environmental benefits and on the quality of monitoring and evaluation across the GEF system.

This Final Evaluation was prepared to:

- ⇒ be undertaken independent of project management to ensure independent quality assurance;
- ⇒ apply UNDP norms and standards for evaluations;
- ⇒ assess achievements of outputs and outcomes, likelihood of the sustainability of outcomes; and if the project met the minimum M&E requirements;
- ⇒ report basic data of the evaluation and the project as well as provide lessons from the Project on broader applicability.

An evaluation mission was fielded to Male' between the 4th and 11th of December 2011. The Terms of Reference (ToRs) for the Final Evaluation are contained in Appendix A.

1.3.2 Key Issues to be Addressed

Key issues addressed on this FE include:

- The appropriateness of the RETDAP concept and design in the context of catalyzing RE investments in the Maldives;
- Implementation of the Project in the context of relevance, efficiency and effectiveness of the activities; and
- Project impacts based on current outputs and outcomes and the likelihood of sustaining project results.

Outputs from this FE will provide guidance in charting future directions on the development renewable energy for the Maldives.

1.3.3 Evaluation Methodology and Structure of the Evaluation

The methodology adopted for this evaluation includes:

- Review of project documentation (i.e. project documents, APRs, meeting minutes of Steering and Advisory Committees) and pertinent background information;
- Interviews with key project personnel including the Project Manager, technical advisors (domestic and international), demonstration project proponents, investors and relevant UNDP staff;
- Interview with relevant stakeholders from Government; and
- Field visits to selected project sites and interviews with beneficiaries.

A full list of documents reviewed and people interviewed is given in Annex B. A detailed itinerary of the Mission is shown in Appendix C. The Evaluation Mission for the UNDP-GEF project was comprised of one International Expert and one National Expert.

This evaluation report is presented as follows:

- An overview of project achievements from the commencement of operations in November 2004;
- An assessment of project results based on project objectives and outcomes through relevance, effectiveness and efficiency criteria;
- Assessment of sustainability of Project outcomes;
- Assessment of the replication or catalytic effect of the Project;
- Assessment of monitoring and evaluation systems;
- Assessment of progress that affected Project outcomes and sustainability; and
- Lessons learned and recommendations.

This evaluation report is designed to meet GEF's "Guidelines for GEF Agencies in Conducting Terminal Evaluations, Evaluation Document No. 3" of 2008:

<http://www.thegef.org/gef/sites/thegef.org/files/documents/Policies-TEguidelines7-31.pdf>

The Evaluation also meets conditions set by the UNDP Document entitled "Handbook on Planning, Monitoring and Evaluating for Development Results", 2009:

<http://www.undp.org/evaluation/handbook/documents/english/pme-handbook.pdf>

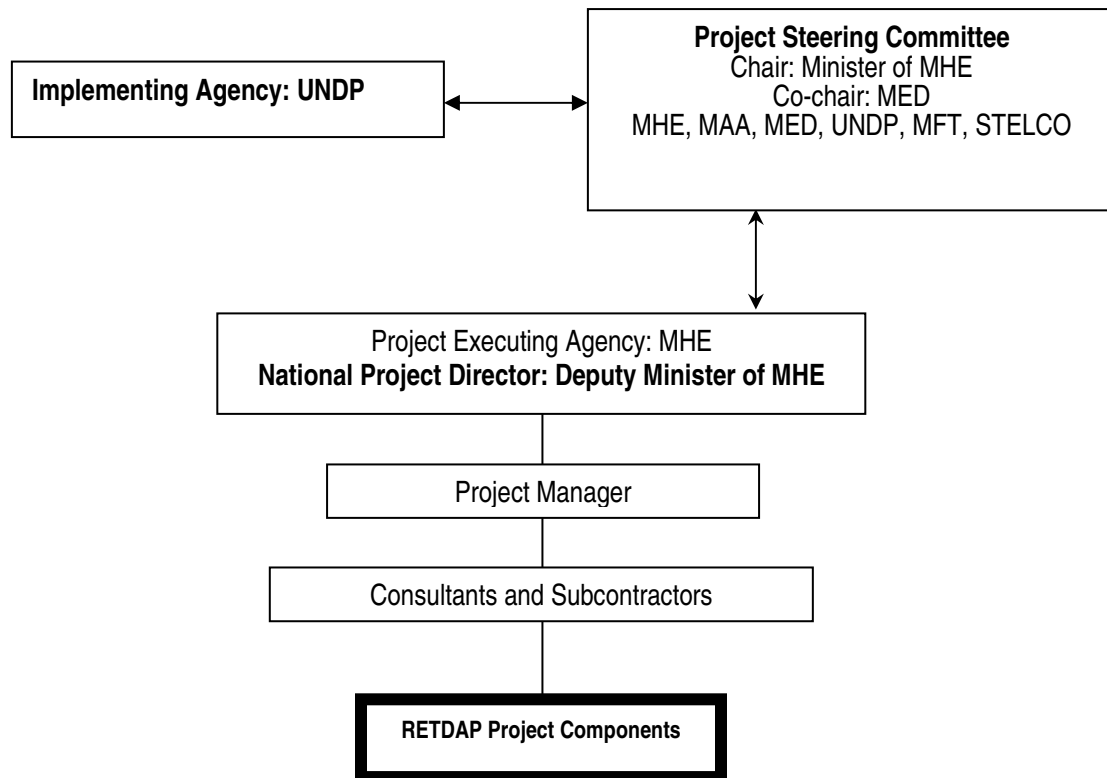
and the “Addendum June 2011 Evaluation”:

<http://www.undp.org/evaluation/documents/HandBook/addendum/Evaluation-Addendum-June-2011.pdf>

1.3.4 Project Implementation Arrangements

The Ministry of Communications, Science and Technology (MCST) was the government-executing agency of RETDAP according to the national execution (NEX) modality in 2004. The executing agency of RETDAP, however, has changed several times during the course of RETDAP from MCST to the Ministry of Environment, Energy and Water (MEEW) in 2006, to the Ministry of Housing, Transport and Environment (MHTE) in 2008 and finally to the Ministry of Housing and Environment (MHE) in 2010. The Deputy Minister for MHE was the Project Director for the project. Day-to-day management was the responsibility of a full-time Project Manager in the MHE. The UNDP Country Office at Male’ carries out project implementation oversight. The project organization chart is shown in Figure 2.

Figure 2: RETDAP Project Implementation Arrangements in 2011



2. ASSESSMENT OF PROJECT RESULTS

2.1 Overview of Project Achievements and Results

The Renewable Energy Technology Development Application Project (RETDAP) commenced operations in late 2004. With almost no baseline activities in RE in the Maldives in 2004, early RETDAP activities between 2004 and 2006 focused on awareness raising amongst government personnel, and the preparations, design and implementation of pilot RE projects on solar, wind and biomass. These pilot projects served as a primary catalyst for the formulation of the country's first National Energy Policy in 2006 that included a target to produce 10% of the country's energy demand by 2015 with 8.5 MW of renewable energy. This phase of RETDAP provided invaluable contributions to the current state of RE knowledge in the Maldives including:

- the collection and analysis of baseline information, including studies on baseline energy demand and supply and tariffs, to assist the GoM in its efforts to formulate energy policies;
- assessments of different RE technologies including biomass, landfill gas, and solar/wind hybrid systems;
- documentation of installation and operational experiences of the RE pilots.

Between 2007 and 2008, RETDAP was to have completed activities to strengthen local capacity and replication of the RE demonstrations as well as setup of a financial mechanism to finance RE projects. A number of factors impeded the achievement of these objectives and delayed completion of RETDAP from June 30, 2008 to December 31, 2011:

- Several changes in the government-executing agency during the course of RETDAP²⁷. Most notable were the significant changes to government ministries in 2008;
- Lack of a full time RETDAP Project Manager between 2007 and 2009 resulting in:
 - a lack of progress in strengthening public awareness programs on renewable energy promotion; and
 - unsuccessful project efforts to fully engage a Maldivian academic institution to deliver technical courses in RE resulting in insignificant changes in local technical capacity on renewable energy from 2004;
- inadequacies in the design (related to the lack of borrower incentives) and financing of FRESA, the revolving loan mechanism resulting in a limited number of RE projects in the country;

Cumulatively, these factors have constrained to some extent the development of national capacity to effectively manage and coordinate RE development in the Maldives. Overall, however, RETDAP has been moderately successful in catalyzing the development of RE projects in the Maldives. The country's 2010 Energy Policy and its declaration to become carbon neutral by 2020 were based on materials and lessons learned from implementing RE projects under RETDAP. Valuable lessons from

²⁷ This included the executing agency MCST changing to MEEW in 2006, MEEW changing to MHTE in 2008, and MHTE changing to MHE in 2010.

implementing solar, wind and biogas pilot projects demonstrated the appropriateness and feasibility of certain RE technologies in the Maldives. These lessons are being used in the development of investment plans under the World Bank / ADB-financed “Sustainable Renewable Energy Program” (SREP).

More importantly, the 2008 spike in fossil fuel prices increased government expenditures nearly two-fold on imported diesel and other fossil fuels. To develop RE for the Maldives as a defense to these externalities, RETDAP could have leveraged its activities to the new government in 2009. Unfortunately, RETDAP was unable to do so since the available technical assistance budget in 2009 was less than USD 60,000 or 86% expended²⁸, insufficient to achieve substantial gains in raising public awareness and local technical capacity to evaluate renewable energy investments (notably with electric utilities such as STELCO) and catalyze replication RE projects.

2.2 Assessment of Project Results

Details of RETDAP achievements and shortcomings are provided in this section against the revised September 2007 Project log-frame that was re-written during the MTE. The original Project log-frame from mid-2004 is shown in Appendix D. Each outcome was evaluated against individual criterion of:

- *Relevance* – the extent to which the outcome is suited to local and national development priorities and organizational policies, including changes over time;
- *Effectiveness* – the extent to which an objective has been achieved or how likely it is to be achieved; and
- *Efficiency* – the extent to which results have been delivered with the least costly resources possible.

The Project outcomes were rated based on the following scale:

- *Highly Satisfactory (HS)*: The project has no shortcomings in the achievement of its objectives;
- *Satisfactory (S)*: The project has minor shortcomings in the achievement of its objectives;
- *Moderately Satisfactory (MS)*: The project has moderate shortcomings in the achievement of its objectives;
- *Moderately Unsatisfactory (MU)*: The project has significant shortcomings in the achievement of its objectives;
- *Unsatisfactory (U)*: The project has major shortcomings in the achievement of its objectives;
- *Highly Unsatisfactory (HU)*: The project has severe shortcomings in the achievement of its objectives.

In addition, this Evaluation also provides an assessment (wherever appropriate) on Project impacts, positive or negative, and possible long-term effects of the outcomes or outputs.

²⁸ RETDAPs TA budget is considered to be USD 475,000 (USD 725,000 less USD 250,000 that was used as seed funds for FRESA)

2.2.1 Project Goal and Objective

Project Goal: Reduction in the annual growth rate of GHG emissions from the increase in the share of renewable energy generation in the Maldivian energy mix.

Intended EOP Outcome:

- ⇒ Target installed capacity of RE in hybrid systems is 260 kW of installed capacity and RE energy production in other RE systems (biogas, others)
- ⇒ GHG reduction will depend on actual operation of RE hybrid and other RE systems
- ⇒ % of RE in energy mix
- ⇒ Number and kind of RE market the project has transformed (hybrids, biogas, waste, SWH, etc.)

Actual EOP Outcome:

- ⇒ Only 118.26 kW of RE hybrid systems has been installed by the Project
- ⇒ Direct GHG reductions are estimated to be 593 tons CO_{2eq} based on assumed RE generation from various pilot solar-diesel and solar-wind hybrid projects. Estimates of RE generation, however, were made by the Evaluator as there has not been any systematic monitoring of GHG emission reductions on these pilot RE projects
- ⇒ With only 118.26 kW of RE systems installed to date, RE comprises a negligible proportion of the country's energy mix
- ⇒ The project cannot claim transformation of the Maldivian RE market. While solar energy would qualify as having the best potential to transform the Maldivian energy sector, the number of solar projects financed from FRESA is too small to be characterized as transformative. However, the interest of the GoM in renewable energy (in particular, solar energy) is very high.

Rating: relevance: MS
 effectiveness: MS
 efficiency: MS
 overall rating: MS

RETDAP supported the installation of a number of pilot projects on solar, wind, and diesel hybrid systems from 2005 to 2008. The number of RE projects replicated from these pilot projects, however, was limited due to a number of factors including:

- ⇒ a lack of incentives for island utilities to convert to RE;
- ⇒ the high cost for private households to convert to RE;
- ⇒ difficulties in the startup of the revolving loan scheme FRESA from 2007 and 2008;
- ⇒ no increase in the number of technical personnel who can plan, design, operate and maintain RE projects; and
- ⇒ no improvements in the low level of awareness of RE technologies amongst electricity users.

These factors are further discussed in the following sections.

No GHG target was set for RETDAP as GHG reductions were difficult to forecast due to the absence of baseline energy data and uncertainty over the types of RE technologies that were to be used and to what extent they would be utilized. Moreover, with the frequent changes in the Project Executing Agency and project manager, no system was

setup to monitor GHG emission reductions from RETDAP. As a result, GHG reduction estimates were based on information provided and calculated by the Evaluator using the methodologies provided in:

- the “Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects, April 16, 2008 (GEF/C.33/Inf.18)”; and
- CDM Executive Board methodologies (AMS.I.D - version 16).

A grid emissions factor of 1.0 tCO₂/MWh was assumed for the Maldivian electricity grid.

Table 1 summarizes the GHG reduction estimates (using GEF guidelines) that were generated during RETDAP (to its estimated terminal date of December 31, 2011).

Table 1: Summary of CO₂ Reductions from the Project

Direct emission reduction ²⁹ , t CO ₂	
	Solar 184
	Wind 409
Total direct emission reduction, t CO₂	593
Direct post-project emission reduction ³⁰ , t CO ₂	388
Total direct post-project emission reduction, t CO₂	388
Indirect bottom-up emission reductions ³¹ , t CO ₂	2,165
Indirect top-down emission reduction ³² , t CO ₂	2,748,000
Indirect emission reduction, t CO₂	2,750,165
TOTAL EMISSION REDUCTIONS DUE TO UNDP-GEF PROJECT, t CO₂ (10-yr cumulative after completion of RETDAP, up to 2021)	2,751,145

²⁹ Direct emission reductions are from RE projects directly supported by RETDAP from February 2006 up to its completion date of December 31, 2011.

³⁰ Direct post-project emissions are estimated from 6 more loans supported by FRESA that will continue to operate a minimum of 10 years after the end of RETDAP (as recommended by GEF manual or less depending on service life of the RE intervention). The types of RE technology investments for FRESA, however, cannot be predicted. Emission reductions were determined by assuming that there are 6 more FRESA loans each of USD 60,000, sufficient to setup 7.5 kW_p of solar panels. Other RE technology installations could be deployed with FRESA loans such as solar-wind hybrid systems, solar assisted air conditioners and solar water heaters.

³¹ Indirect emissions are from “replication” projects developed with knowledge of RETDAP demonstrations but without RETDAP assistance. Bottom-up emission reductions are estimated from the replication factor of 1.5 due to limited success of demonstrating solar home systems combined with limited local technical capacity to service solar systems and that emission reductions were generated during RETDAP and 10 years after the completion of RETDAP.

³² Indirect emissions are from “replication” projects developed with knowledge of RETDAP demonstrations but without RETDAP assistance. Indirect top-down emission reductions are estimated assuming a 10-year market potential of 13.74 MtCO₂ (estimated from the BeCitizen 2009 Carbon Audit for the Maldives (<http://cbr.groupedr.ch/common/medias/?uid=maldives-carbon-audit>, pg 13) for non-transport related GHG emissions of 916,000 tCO₂; an average 10-yr emission of 1.374 MtCO₂ (from the doubling of 2009 GHG emissions by 2021); and a cumulative 10-yr GHG emission market of 13.74 MtCO₂); and a causality factor of 20%. The 20% causality factor is estimated due to the country's current challenges to source capital for RE projects. The causality factor would be greater if more capital is available (GoM wants to re-capitalize FRESA after RETDAP is completed), if awareness of the RE and sources of financing is properly promoted, and if local technical capacity is strengthened to properly manage RE investments to ensure that maximum ERs are generated.

While the impact of RETDAP has been significant, the evaluator has noted that:

- public awareness of RE in the country remains poor notwithstanding the global publicity generated by GoM's 2009 declaration to become carbon neutral by 2020;
- the pool of skilled and knowledgeable technicians in the Maldives on RE is improving in Male' based on local demand from various RE entrepreneurs who are being supported through FRESA loans. Their skill sets in electronics and refrigeration serve as good platforms for further training on RE equipment installation and servicing;
- in contrast, considerable improvement in the knowledge of technicians in the island communities will be required if RE generation is to be sustained throughout the Maldives; and
- the capital available in the FRESA fund was too small to make a visible and high profile impact on promoting RE development in the Maldives.

2.2.2 Component 1: RE Policy Development and Institutional Strengthening

Intended Outcome 1:

- ⇒ Policy approved and implemented
- ⇒ Strategy and regulation to promote RE for community electrification (hybrids), individual (biogas, SWH) and waste-to-energy applications
- ⇒ Energy Department adequately staffed
- ⇒ Energy supply and demand survey
- ⇒ Integral least-cost assessment of conventional and RE technologies (proposed)
- ⇒ Regularly updated energy balances
- ⇒ Energy policy approved and implemented
- ⇒ Studies completed, RE strategy formulated and national workshops held
- ⇒ RE targets integrated into 7th National Development Plan

Actual Outcome 1:

- ⇒ A 2006 Energy Policy was promulgated, a direct result of RETDAP assistance. A subsequent 2010 Energy Policy was also formulated without direct assistance of RETDAP. The contents of the 2010 Energy Policy, however, relied considerably on RE project materials and demonstration experiences from RETDAP
- ⇒ The 2010 Energy Policy contains strategies and guidance for the formulation and enforcement of regulations to promote RE for island community electrification
- ⇒ The departments in charge of energy related issues are within the Ministry of Housing and Environment, and are chronically short staffed. This includes the Climate Change and Energy Department (CCED) and the Maldives Energy Authority (MEA)
- ⇒ Energy supply and demand surveys for 2006, 2008 and 2009 were completed and compiled into a Report on "Energy Demand and Supply for the Maldives"
- ⇒ A preliminary financial assessment of solar PV investments on small islands was completed by the Climate Change and Energy Department in 2011. The assessment was a government initiative that relied on the experiences of solar PV demonstrations supported by RETDAP
- ⇒ Energy balances were updated for 2006, 2008 and 2009
- ⇒ The 2010 Energy Policy is now approved but in need of action plans to implement the Policy
- ⇒ RE strategy developed in the 2006 and 2010 Energy Policy. RETDAP-supported

national policy workshops were held in 2005
 ⇒ *RE target expressed in the 2020 Carbon Neutrality and in recent speeches made by the President where 60% of the RE by 2020 will be from solar³³*

Rating: relevance: HS
 effectiveness: MS
 efficiency: S
 overall rating: S

RETDAP was instrumental in providing the foundation and support for the GoM to formulate its first renewable energy policy in 2006. Early RETDAP activities focused on collecting energy baseline information resulting in the updating of the 2003 and 2004 energy balances in 2005 as well as for 2008 and 2009. In 2005, the project supported consultancies and workshops to facilitate the process of energy policy formulation. An international consultant worked closely with the country's Energy Advisory Committee as well as a wide spectrum of government ministries and stakeholders. This resulted in the drafting of the first National Energy Policy (NEP) in 2005, which was shared amongst government ministries, media and other relevant agencies at two national workshops on "National Energy Policy and Energy Plan".

RETDAP also supported government staff training on RE policy with the objective of facilitating the build-up of adequate staffing levels in the relevant government departments. Early RETDAP-supported training led to an increase in staffing levels of energy-related agencies from three (3) in 2006 to 12 officers in 2007 and 16 in 2009. Unfortunately, a number of CCED and MEA officers left these agencies for studies abroad and personal reasons, some of them sponsored by donor agencies. Today, there are 11 officers dedicated to energy issues in MoHE, with 16 officers considered as an adequate number of staff. There are no foreseeable increases in staffing levels due to a government hiring freeze since 2009. Another threat to adequate staffing of energy-related agencies is the civil service policy of shifting government officers to differing portfolios every 3 years. The moving of current government officers from the CCED and the MEA would result in the loss of corporate memory of recent energy policy developments.

The GoM developed the 2010 Energy Policy in-house. The Policy defines the importance of renewable energy and energy efficiency in the development of the Maldives. The contribution of RETDAP information resources including the collection of baseline energy data and RE pilot project experience was significant to the formulation of the 2010 Energy Policy.

2.2.3 Component 2: RE Resources Assessment

Intended Outcome 2:

- ⇒ Comprehensive RE resource database expanded with biomass and ocean energy potential assessments
- ⇒ More detailed biomass assessment in atoll island groups and studies on ocean thermal energy conversion (OTEC) and marine waves
- ⇒ Staff has been adequately trained on solar and wind measurements as well as of biomass and waste assessment

³³ <http://www.presidencymaldives.gov.mv/Index.aspx?lid=13&dcid=5983>

⇒ **About 30% of trained staff is involved in providing training**

Actual Outcome 2:

- ⇒ *RE resource data for 4 wind stations and one solar station (at Hulhule) compiled. No comprehensive data generated for marine currents or OTEC for energy production although the issues were studied in 2010 by the Robert Gordon University of Aberdeen Scotland*
- ⇒ *A number of RE assessment studies were undertaken including: i) a 2009 biomass resource assessment for inhabited and uninhabited islands as well as a separate assessment for Male (results are published in the 2009 “Maldives Energy Supply and Demand Report”); ii) estimates of landfill gas generation at the Thilafushi landfill; iii) estimates for gas generation using a biogas digester from Guarantee Fiberglass Fabrication in Male; iv) a 2011 assessment of the use of marine currents and OTEC for energy production by the Robert Gordon University of Aberdeen Scotland*
- ⇒ *Staff at the Department of Meteorology was trained in the use and maintenance of equipment for collecting wind and solar data. There has been no such training for biomass and waste.*
- ⇒ *The number of trained staff to provide training is not known*

<i>Rating:</i>	<i>relevance:</i>	<i>S</i>
	<i>effectiveness:</i>	<i>S</i>
	<i>efficiency:</i>	<i>S</i>
	<i>overall rating:</i>	<i>S</i>

In 2005, RETDAP supported the collection of wind data at four stations located in four atoll regions and one solar station at Hulhule (near Male). Measuring equipment has been given to the Department of Meteorology whose staff were trained on maintenance of the equipment and international standards for wind and solar data collection. The staff were able to analyze all wind and Hulhule solar data to establish the country's average wind speed of 5.8 m/s (at 40 m height) and average annual solar irradiation of 2,054 kWh/m² with the annual average sunshine hours of 2,891 hrs. Much of this data has been shared with agencies such as the Red Cross and Maldives Gas who used the information to assess development of wind and solar energy on remote island communities.

A study on ocean currents and OTEC as resources for renewable energy for the Maldives was completed in 2011 by the Robert Gordon University of Aberdeen, Scotland with support from the Scottish Government. The report provides the GoM with a number of recommendations to support the Maldivian goal of carbon neutrality by 2020 that includes data collection and further investigations into the feasibility of ocean currents to generate useable electricity.

2.2.4 Component 3: RE Advocacy and Awareness

Intended Outcome 3:

- ⇒ **Fully functioning RE information center cum one stop-shop, continuing the education and awareness enhancement initiated under RETDAP:**
 1. **Fully functioning RE Center established and functioning that provides one-stop-shop services (to about 40 clients annually), collects and disseminates information in printed and electronic form, circulates a RE newsletter, organises technical and other trainings on RE and gathers data on ongoing RE activities in Maldives**

2. Product exhibition
3. Awareness creation activities and technology demonstration in OIA
4. Media and communication action plan.

Actual Outcome 3:

⇒ *RE information center was operational in 2009. The Center only functioned as a distribution center for RE promotional material. The Center did not survive the after 2008 when the Project executing agency changed from MEEW to MHTE in 2008 and from MHTE to MHE in 2010:*

1. *RE information center is no longer operational as of late 2009*
2. *While no RE product exhibition was held, RE demonstrations were held in various islands such as Mandhoo Island which raised public awareness of the feasibility of setting RE projects throughout the Maldives*
3. *Awareness activities consisted of project personnel advising interested stakeholders on where to seek financing for RE projects and supporting two Provincial workshops with school children in 2009*
4. *A media and communication action plan was prepared in 2006*

Rating: relevance: MS
 effectiveness: MU
 efficiency: U
 overall rating: MU

The opening of the RE Information Center was originally intended for 2008 but was delayed to 2009 in part due to changes being made within MHTE. While the Center was briefly opened in 2009, plans to sustain the Center were dropped as the GoM was planning to shift the promotion of RE to the Ministry of Economic Development (MED). During the 2008 to 2010 period of RETDAP, there was no full-time project manager.

RETDAP did provide resources for an international consultant who prepared the public information dissemination plans in 2005. Initial actions of the plans were to distribute leaflets on renewable energy development in the Maldives, targeting households as well as private and government offices. These dissemination plans detailed the development of the RE Information Center as a “one-stop-shop service” for RE market promotion.

In addition, there is no MHE website for the promotion of renewable energy. This may in part be due to lack of clarity on who is the lead institution in the Maldives on promoting renewable energy development. Currently, there are no government websites dedicated to the promotion of the government’s position on renewable energy.

In conclusion, RETDAP activities have not led to any sustained activities that promote RE development in the Maldives today. However, the awareness raising of RETDAP’s RE pilot activities such as the Mandhoo Island solar-diesel hybrid project from 2006, has made a lasting impact amongst government officers who are currently involved with RE development in the Maldives. The lessons learned from the operation of the Mandhoo Island pilot catalysed the GoM into allocating budget for the installation of solar-diesel hybrid projects on six islands under the “Solar Maldives Program”. Despite the raised awareness of RETDAP amongst GoM personnel, there remains an urgent need for stronger promotion and raising awareness of RE development in the Maldives.

2.2.5 Component 4: RE Technical Capacity Building

Intended Outcome 4:

- ⇒ Assessment of RE technology support system and recommendations
- ⇒ Comprehensive training course established (in cooperation with Maldivian educational institutes) on RE feasibility and management as well technical training (design, installation, maintenance and operation):
 1. Assessments have been carried out of viability of local RE consultancy and engineering services and local manufacturing of components
 2. Plan formulated to enhance capacity of RE technology support system (solar & wind hybrids, biogas, waste, SWH, biomass)
 3. Trained staff from MEEW, other government entities and private sector (on-the-job, seminars, study tour)
 4. Annual training course of RE
 5. At least 50% of trained staff is involved in RE management, operation or installation
 6. Proposals for RE projects in OIA (how many?).

Actual Outcome 4:

- ⇒ *There is no assessment of RE technology support systems. As a result, no plans and strategies were developed for building technical capacities in the Maldives for installing, operating and maintaining RE equipment*
- ⇒ *No comprehensive training courses on RE feasibility, management, design, installation, operation and maintenance have been developed:*
 1. *No assessments on the viability of RE consultancies, engineering services and local manufacturing done by the project. Assessments of RE investments were only been conducted as a part of the due diligence process for loan approvals on FRESA*
 2. *No plan prepared for improving local technical capacity for RE technologies*
 3. *Government and private sector personnel have received training on solar diesel hybrid projects (2006), attended RE and EE seminars and study tours to Malaysia and Thailand (2006), received more training on solar and biomass projects (2007) and biogas digesters (2008), and attended seminars (along with resort personnel) on RE and energy conservation (2007). The number of trained personnel still in government positions is unknown*
 4. *A syllabus for “renewable energy systems and maintenance” was developed by the Faculty of Engineering at Maldives Polytechnic in 2008. However, no annual training courses are in place to deliver the course. The barrier to conducting the training course is the availability of qualified personnel to deliver RE training in the Maldives; RETDAP has been unable to engage any national or international consultants to assist in the delivery of this training*
 5. *No trained staff on RE management, operation or installation resulting from RETDAP activities*
 6. *There are a number of proposals for RE projects including the “Solar Maldives Program” as well as a few foreign private sector companies from India and China*

Rating: relevance: U
 effectiveness: U
 efficiency: U
 overall rating: U

RETDAP technical training activities in 2005 and 2006 benefited from the RE reports prepared by the SMILES, a project that examined the feasibility of various RE technologies in 2003 and 2004, and provided recommendations on the removal of financial and regulatory barriers as well as the building of required capacities for sustained development of RE in the Maldives. RETDAP supported study tours, seminars and training courses for government personnel on RE technologies and energy efficiency options that would be appropriate for the Maldives.

Following the changes within the GoM and the absence of a full-time Project Manager after 2007, there were fewer training activities that mainly targeted government personnel. Technical training for installing, operating and maintaining RE projects was notably absent with the exception of solar-wind hybrid technical training on Fainu Island in 2007.

2.2.6 Component 5: RE Project Financing Schemes

Intended Outcome 5:

- ⇒ The RE Center at MEEW processes about 40 applications
- ⇒ Provision of “Fund for Renewable Energy System Applications” (FRESA) financing to approved applicants:
 1. Training courses conducted for private and government financial institutions; commercial banks; and private entrepreneurs
 2. Clear and well-defined mechanics and target groups of the FRESA financing scheme and legal status established
 3. FRESA established
 4. Exit strategy for FRESA for post-RETDAP period defined.

Actual Outcome 5:

- ⇒ *The Bank of Maldives in close collaboration with the MHE have processed over 6 applications for RE financing for FRESA of which 4 loans (averaging around USD 60,000) have been disbursed to entrepreneurs for RE financing*
- ⇒ *FRESA has approved and provided RE financing to 4 applicants:*
 1. *Training on RE project finance was provided in 2007 for personnel from the Bank of Maldives and selected entrepreneurs. Training for credit officers was provided in 2010. Evaluation of the technical feasibility of loan applications was provided by external technical consultants*
 2. *Legal status of FRESA was established in 2007. Target groups identified in the November 2006 FRESA guidelines ranged from private households to private corporations and SMEs*
 3. *FRESA was established in 2008*
 4. *Exit strategy for FRESA in a post-RETDAP regime was prepared in December 2011*

Rating: relevance: HS
 effectiveness: MS
 efficiency: S
 overall rating: S

The outcome of this component has been the successful development of a functional USD 250,000 revolving fund for financing renewable energy projects. After the

successful solar hybrid demonstrations in 2006, RETDAP developed FRESA with the Bank of Maldives and the MFT. FRESA became operational in 2008; however, with no applications for RE loans for almost one year, interest rates for loans were dropped from 8% to 3% facilitating the approval of one loan in 2009 to a local RE entrepreneur. As of 2011, 3 more loans have been approved exhausting all FRESA funds.

Though a wide range of target borrower groups were identified in the FRESA design documents, there is still a lack of interest in RE borrowing amongst private households, SMEs and cooperatives. This lack of interest can be attributed to a number of factors including:

- low level of awareness amongst electricity consumers and private sector companies of potential energy savings from using renewable energy technologies;
- the high cost of RE and lack of economic incentives for private households, SMEs or cooperatives to convert to renewable energy;
- the FRESA requirement of only financing 80% of the capital required for the RE project or business;
- administrative efforts required for loan approvals.

The effectiveness of FRESA could have been enhanced with additional funds and improved efforts to raise awareness of RE in the Maldives. The approval of four loans in the 3-year existence of FRESA was insufficient to raise the profile of RE in the Maldives. Moreover, the USD 250,000 did not sufficiently cover:

- administrative costs of loan approvals for FRESA with actual costs being around 4%; and
- promotional costs. Borrowers had heard of FRESA through word-of-mouth.

As of December 2011, FRESA funds have been exhausted with the approval of four loans totaling ~USD 248,000. The outcome of loans from FRESA has been financing support to local entrepreneurs (such as Renewable Energy Maldives and Sight & Sound) to build their inventories for RE projects. FRESA supported the procurement of RE items (mostly solar panels, but also small wind turbines and equipment related to bio-digesters) as well as equipment related to energy efficiency (including solar-assisted air conditioners and LED street lights that can be powered by solar panels). The 2011 evaluation of FRESA³⁴ has recommended three exit strategy options for UNDP of which the upgrading of FRESA in cooperation with MHE appeared to be most favored. Features under consideration for the upgrading of FRESA include:

- the addition of financing for energy efficiency initiatives;
- sufficient funding to cover costs for administration and fund promotion;
- the exclusion of financing for adaptation measures given the lack of clarity on how the loans would be re-paid.

³⁴ "Evaluation of FRESA" by Æquilibrium Consulting GmbH, December 2011. Other options included the development of a new and expanded fund with MHE to develop, and the termination of FRESA.

2.2.7 Component 6: RE System Project Development

Intended Outcome 6:

- ⇒ Installation of at least 260 kW RE in hybrid systems
- ⇒ Installation of household biogas systems
- ⇒ Plans for other RE systems (biomass, SWH, waste-to-energy):
 1. Surveys and baseline analysis on selected Islands
 2. Installation of hybrid systems in various islands with a total capacity of 260 kW
 3. At least 5 biogas digesters installed and operational
 4. Potential livelihood support and productivity projects are proposed and evaluated
 5. Plans for installation of hybrid systems in 100 islands
 6. Plans for development of other RE sources (e.g., biomass, waste-to-energy).

Actual Outcome 6.1:

- ⇒ *Only 118 kW of RE hybrid systems has been installed as a direct impact of RETDAP assistance including 12 kW of solar-diesel hybrid at Mandhoo Island, 8 kW of solar-wind hybrid at Fainu Island, and 3 other solar-wind-diesel hybrid projects executed by Maldives Gas wind hybrid systems on Uligan, Raiymandhoo and Kondey Islands*
- ⇒ *Five household biogas systems were tested*
- ⇒ *Various plans for other RE systems developed including:*
 1. *Surveys and baseline studies for the use of biomass and solar as a resource as contained in the “Report on Energy Supply and Demand 2008-09”. Wind resource availability also surveyed for selected islands in 2005 and 2006*
 2. *Plans for 118 kW of RE hybrid systems completed and implemented*
 3. *Three bio-digesters were developed by RETDAP in early 2009 in partnership with a local firm, Guarantee Fibreglass Fabrications. These bio-digesters are reportedly operational today. Another 2 bio-digesters were developed in late 2009 in collaboration with UNIDO. Second hand reports from users indicate that these bio-digesters are currently not operational.*
 4. *One “livelihood and support” program has been proposed by UNDP, namely the “Maldives Low Emission Climate Resilient Development Programme”. The goal of the program is to support communities in Laamu Atoll increase their resilience to climate change, through green and inclusive development and increased energy security*
 5. *The GoM have plans in place for the development of solar-diesel hybrid projects on 29 islands under the “Solar Maldives Program” (launched in 2011). The Program has a target of 20% energy demand being achieved from solar on these islands with current budget allocations over the next year sufficient to install less than 1.0 MW on 6 islands. Project designs will be based on lessons learned from the Mandhoo Island solar-diesel hybrid project. The GoM’s overall solar RE target is 60% generation for the country.*

Rating: relevance: S
 effectiveness: MS
 efficiency: MU
 overall rating: MS

The most prominent pilot system setup by RETDAP was the 12 kW solar-diesel system at Mandhoo Island in 2005-06. While there were other pilots setup using solar-wind and biomass, the solar-diesel pilot at Mandhoo was the most successful, imparting a number of useful lessons to Maldivian stakeholders on the operation and maintenance of RE systems, in particular solar-diesel hybrid systems. The current “Solar Maldives

Program” under the GoM and managed by MHE is designed using lessons learned from Mandhoo pilot. One of the lessons learned from the Mandhoo pilot is the need for careful assessment of the use of battery banks to store solar energy for night use. At the Mandhoo pilot, over 120 lead acid batteries were required for 12 kW to store solar energy for night use. These batteries, however, only have a service life of 4 years and pose an environmental problem when they are disposed; the net result of the use of battery banks is an incremental increase of over \$0.20/kWh of solar electricity produced. The Mandhoo pilot also imparted valuable lessons on the repairs of solar inverters, which had malfunctioned from lightning strikes: spare parts and technical repair assistance need to be sourced regionally. In comparing the RE market in 2005 with 2011, regional sourcing of spare parts and technical repair assistance is easier today.

After 2008, pilot projects seemed to suffer from a lack of involvement from RETDAP. No reports were available on the operations of the pilot plants in 2010 and 2011. A 2011 SREP mission reported that 25% of all RE projects in the Maldives were not operational. As well, five bio-digesters and two solar desalination plants were reportedly set up in 2009 and 2010 respectively in collaboration with UNIDO on Fainu and Goidhoo Islands; however, there were no reports available to the Evaluator to gauge the performance of these bio-digesters nor has there been any reporting on the current use and operations of the pilot projects.

In conclusion, the RETDAP pilots from 2005 and 2006 have provided valuable experience to government officers on the design and implementation of solar-diesel hybrid systems for the Maldives. The lessons learned from these RETDAP pilots have been valuable contributions to current government and donor-assisted RE projects including the “Solar Maldives Program” and the SREP project. However, after 2008, there was an absence of reports on the performance of the pilot projects; this was a direct result of the lack of a full-time RETDAP project manager that lowered the project’s prominence in developing RE pilot activities in the Maldives.

2.2.8 Overall Evaluation of Project

The overall rating of the project results is MS. This is based on the Project achieving its intended outcomes including:

- enabling the GoM to develop effective RE policies;
- establishing the potential and feasibility of utilizing available RE resources;
- the launching of a highly visible solar-diesel hybrid pilot project on Mandhoo Island;
- the awareness raised on RE through the Mandhoo pilot project amongst government officers; and
- the successful piloting of a financial mechanism for RE through the setup of FRESA.

Factors that have hindered the project to meet all of its intended outcomes include the lack of a strategic plan to create RE public awareness, and the absence of any programmes or activities to improve local RE technical capacity of entrepreneurs and policymakers. A summary of ratings for all outcomes is provided In Table 3.

Table 3: Assessment of Sustainability of Outcomes

Project Outcome	Relevance	Efficiency	Effective-ness	Overall Rating
Outcome 1: Policies, laws and regulations developed to support development of renewable energy in the Maldives	HS	MS	S	S
Outcome 2: Potential and feasibility of utilizing available RE resources in the Maldives has been established	S	S	S	S
Outcome 3: Awareness of RE created and improved amongst users	MS	MU	U	MU
Outcome 4: Understanding of RE technology amongst energy and equipment providers and decision-makers improved	U	U	U	U
Outcome 5: Increase in finance and financing mechanisms for RE-based energy projects	HS	MS	S	S
Outcome 6: Techno-economic feasibility of RET is established, and proposals for RE-based projects in the outer islands and atolls are developed	S	MS	MU	MS
Monitoring and Evaluation	MU	MU	MU	MU
Overall Rating	MS	MS	MS	MS

3. SUSTAINABILITY OF PROJECT OUTCOMES

In assessing Project sustainability, we asked “how likely will the Project outcomes be sustained beyond Project termination?” Sustainability of these objectives was evaluated in the dimensions of financial resources, socio-political risks, institutional framework and governance, and environmental factors, using a simple ranking scheme:

- *Likely (L)*: very likely to continue and resources in place;
- *Moderately Likely (ML)*: model is viable, but funding or resources may not be in place;
- *Moderately Unlikely (MU)*: model is not viable or needs changing; and/or resources not in place; and
- *Unlikely (U)*: model is not viable and resources are not in place.

The evaluation for sustainability is shown in Table 2. The Table provides a rating of the project design and viability going forward, including availability of budget and resources for continuation.

The overall Project sustainability rating is MU. This rating is primarily based on:

- The GoM policies to promote RE are in place. However, specific action plans are required to identify the resources and lead agencies to implement the strategies of the 2010 Energy Policy;
- Resources are in place for the continued collection of wind and solar data. However, there are no resources to collect data for ocean energy data even though there is an agreement signed with Robert Gordon University of Scotland for the collection of such data;
- The lack of any plan or resources to promote RE awareness in the Maldives;
- The lack of system, plan or resources to build local technical capacity for developing, maintaining and operating RE systems in the Maldives;
- The successful launching of FRESA, the revolving fund for financing RE systems, and the willingness of GoM officials to seek the means of re-capitalizing FRESA and sustaining its operations until 2020;
- The success of the Mandhoo Island solar-diesel hybrid system and the use of lessons learned from this pilot to design the current “Solar Maldives Program” that is being managed by the MHE.

Table 4: Assessment of Sustainability of Outcomes

Actual Outcomes (as of December 2011)	Assessment of Sustainability	Dimensions of Sustainability
<p>Actual Outcome 1: Policies, laws and regulations developed to support development of RE in the Maldives</p>	<ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources for the recruitment of additional staff to enforce RE policies, laws and regulations are not available. There is currently a GoM hiring freeze for additional staff that affects achieving adequate staffing levels in the Climate Change and Energy Department within the MHE; • <i>Socio-Political Risks:</i> Risks are low as the GoM is committed to carbon neutrality by 2020; • <i>Institutional Framework and Governance:</i> The Climate Change and Energy Department (CCED) and the Maldives Energy Authority (MEA) within the MHE are the most competent agencies to advance the development of RE in the Maldives. CCED are managing the “Solar Maldives Program” and providing analysis to advance RE policies. MEA managed the government’s recent announcement of the feed-in tariff. Both agencies, however, are short of staff to effectively manage all ongoing RE initiatives, and hence, the evaluator has concerns over the sustainability of enforcing RE policies, laws and regulations. • <i>Environmental Factors:</i> Policies contribute towards greater energy security for the Maldives and the reduction of GHG emissions. <p style="text-align: right;"><i>Overall Rating</i></p>	<p style="text-align: center;">ML</p> <p style="text-align: center;">L</p> <p style="text-align: center;">MU</p> <p style="text-align: center;">L</p> <p style="text-align: center;">ML</p>
<p>Actual Outcome 2: Potential and feasibility of utilizing available RE resources in the Maldives has been established</p>	<ul style="list-style-type: none"> • <i>Financial Resources:</i> Sufficient resources are in place at the Department of Meteorology to continue the monitoring of wind and solar resources for the purposes of developing RE projects. Biomass availability is being monitored through the CDM project at the Thilafushi landfill near Male through a private company. No financial resources are available on other islands to monitor biomass generation in part due to the lack of interest and the small biomass quantities available. In addition, there are no financial resources in place to collect data for ocean energy potential notwithstanding the studies on ocean currents and OTEC potential by the Robert Gordon University of Aberdeen, Scotland; • <i>Socio-Political Risks:</i> No risks as the Department of Meteorology oversees the collection and management of wind and solar data; • <i>Institutional Framework and Governance:</i> Department of Meteorology 	<p style="text-align: center;">ML</p> <p style="text-align: center;">L</p> <p style="text-align: center;">L</p>

Table 4: Assessment of Sustainability of Outcomes

Actual Outcomes (as of December 2011)	Assessment of Sustainability	Dimensions of Sustainability
	<p>oversees the collection and management of wind and solar data. Information on biomass availability is housed in the Climate Change and Energy Department;</p> <ul style="list-style-type: none"> • <u>Environmental Factors</u>: Collection of data and information of RE resources contribute towards greater energy security for the Maldives and the reduction of GHG emissions. <p style="text-align: right;"><u>Overall Rating</u></p>	<p style="text-align: center;">L</p> <p style="text-align: center;">ML</p>
<p>Actual Outcome 3: Awareness of RE only created and improved amongst selected government officials and 4 private sector firms involved with developing RE projects and selling equipment</p>	<ul style="list-style-type: none"> • <u>Financial Resources</u>: No financial resources are in place to raise RE awareness beyond the outcome of this activity. This would include a lack of resources to support an operational RE Information Center; • <u>Socio-Political Risks</u>: There is a lack of clarity as to which GoM agency responsible for the promotion of RE amongst users in the Maldives. While the Climate Change and Energy Department would appear to be the logical agency to promote RE, the Ministry of Economic Development appears as the lead agency undertaking RE promotion with the CCED responsible for policy formulation and RE technical issues; • <u>Institutional Framework and Governance</u>: There is a disconnect between the Climate Change and Energy Department and the Ministry of Economic Development in undertaking RE promotion. There are no government websites dedicated to promoting RE in the Maldives; • <u>Environmental Factors</u>: Awareness raising of RE resources contribute towards greater energy security for the Maldives and the reduction of GHG emissions. <p style="text-align: right;"><u>Overall Rating</u></p>	<p style="text-align: center;">U</p> <p style="text-align: center;">U</p> <p style="text-align: center;">U</p> <p style="text-align: center;">L</p> <p style="text-align: center;">U</p>
<p>Actual Outcome 4: Understanding of RE technology confined to a few government officials in the MHE and entrepreneurs with FRESA loans</p>	<ul style="list-style-type: none"> • <u>Financial Resources</u>: There are no resources in place within GoM to advance local technical capacity for renewable energy. The ADB through SREP are committed to grant financing of further government capacity building for RE development within the MHE; • <u>Socio-Political Risks</u>: With no resources or strategy left by RETDAP on improving local technical capacity, personnel from companies who borrowed funds from FRESA will advance their knowledge of RE systems through their equipment suppliers under their own initiative. 	<p style="text-align: center;">MU</p> <p style="text-align: center;">MU</p>

Table 4: Assessment of Sustainability of Outcomes

Actual Outcomes (as of December 2011)	Assessment of Sustainability	Dimensions of Sustainability
	<p>Government personnel will likely rely on donor assistance to attend regional seminars, workshops and overseas studies on various RE topics. There are no local professionals who could deliver RE training courses at Maldives Polytechnic;</p> <ul style="list-style-type: none"> • <u><i>Institutional Framework and Governance</i></u>: There are no institutional mechanisms in place to advance RE technical knowledge amongst GoM officers or practicing technicians; • <u><i>Environmental Factors</i></u>: There is wide acknowledgement of the need to improving indigenous RE technical knowledge that will contribute towards greater energy security for the Maldives and the reduction of GHG emissions. <p style="text-align: right;"><u>Overall Rating</u></p>	<p style="text-align: center;">U</p> <p style="text-align: center;">L</p> <p style="text-align: center;">U</p>
<p>Actual Outcome 5: Increased available finance and financial mechanisms for renewable energy projects in the Maldives</p>	<ul style="list-style-type: none"> • <u><i>Financial Resources</i></u>: The GoM through the Bank of Maldives is seeking to re-capitalize FRESA to provide more RE loans in the Maldives. RETDAP is providing recommendations on the post-FRESA architecture that will determine the necessary amounts of re-capitalization; • <u><i>Socio-Political Risks</i></u>: The continuation of FRESA after 2011 is favored by the GoM. The president has noted that the cost of de-carbonizing the Maldives before 2020 will cost between USD 3 to 5 billion; • <u><i>Institutional Framework and Governance</i></u>: Institutional arrangements to operate FRESA are in place with the Bank of Maldives and the MHE. These arrangements are likely to continue with the post-RETDAP FRESA; • <u><i>Environmental Factors</i></u>: Increasing access to financial resources for RE projects contributes towards greater energy security for the Maldives and the reduction of GHG emissions. <p style="text-align: right;"><u>Overall Rating</u></p>	<p style="text-align: center;">ML</p> <p style="text-align: center;">ML</p> <p style="text-align: center;">L</p> <p style="text-align: center;">L</p> <p style="text-align: center;">ML</p>
<p>Actual Outcome 6: Techno-economic feasibility of RE hybrid projects (i.e. solar-diesel, solar-wind) as well as biogas generation and desalination plants has been established catalyzing the</p>	<ul style="list-style-type: none"> • <u><i>Financial Resources</i></u>: Resources for continued development of solar-diesel hybrid projects are in place for 29 islands through the MHE-managed “Solar Maldives Program”. Donor commitments have also been made for financing more desalination plants (through USAID) as well as other solar hybrid projects (through SREP and JICA grants); 	<p style="text-align: center;">L</p>

Table 4: Assessment of Sustainability of Outcomes

Actual Outcomes (as of December 2011)	Assessment of Sustainability	Dimensions of Sustainability
development of RE-based projects for outer islands and atolls	<ul style="list-style-type: none"> • <i>Socio-Political Risks:</i> Additional scaled-up RE programmes only supports the GoM's commitments to carbon neutrality for 2020; • <i>Institutional Framework and Governance:</i> MHE is the main government agency responsible for RE policy and regulatory enforcement. There are concerns, however, over the government policy to rotate civil servants every 3 years to differing government portfolios. This would affect the corporate memory of the CCED and impact the progress of developing more RE projects in the Maldives; • <i>Environmental Factors:</i> Successfully managed pilot and demonstration projects will contribute towards development of more RE projects, greater energy security and the reduction of GHG emissions in the Maldives. <p style="text-align: right;"><u>Overall Rating</u></p>	<p style="text-align: center;">L</p> <p style="text-align: center;">ML</p> <p style="text-align: center;">L</p> <p style="text-align: center;">ML</p>
Overall Project Sustainability:		MU

4. REPLICABILITY OR CATALYTIC ROLE

Under UNDP during the period of 2003 to 2007, RETDAP along with the SMILES project (2003-06) played a catalytic role in the development of renewable energy projects in the Maldives. With SMILES providing baseline and feasibility-level studies of various renewable energy technologies, and RETDAP supporting collection of RE data collection, renewable energy demonstrations and RE policy formulation from 2005 to 2007, awareness of the process of developing RE in the Maldives was raised amongst policymakers and island communities. SMILES studies included comparisons of various RE technologies, deployment strategies, financial and economic returns, and assessments of energy demand, and surveys of wind, solar, biomass and landfill resources. RETDAP set up wind and solar data collection stations as well as the study on ocean energy potential for the Maldives.

Prior to 2008, renewable resources such as solar PV and wind were not economic for the Maldives in comparison to electricity from fossil fuel sources, which to some extent limited the country's drive for replication of the RE demonstrations. The sharp rise in fossil fuel prices in 2008, however, did expose the vulnerabilities of the Maldivian economy, and is viewed as the primary driver in RE development today in the Maldives leading to:

- the development of GoM's 2010 National Energy Policy which was formulated in 2008 with RETDAP assistance to improve their energy security through carbon neutrality and development of RE;
- GoM's December 2011 announcement of the RE feed-in tariff to catalyze more RE investments. RETDAP resources were used to prepare a feed-in tariff study in 2009;
- GoM resources being allocated for the "Solar Maldives Program", a program to develop RE for 29 islands of which there are budget allocations in 2012 for solar-diesel hybrid projects for six islands. Projects under this program are using lessons learned from the RETDAP-supported Mandhoo Island solar-diesel hybrid project (and other RE pilot projects) of 2006;
- attracting other sources of funding including state entities (such as Maldives Gas and its parent company STO) that were previously not interested in renewable energy.

To some extent, RETDAP has also catalyzed mobilization of donor resources for RE development including:

- Bilateral resources from USAID (SARI/Energy project that promotes energy security through increased trade, investment and access to clean sources of power and fuel in the Maldives since 2000), Denmark (Atoll RE Development being managed under the One UN Trust Fund), JICA (Clean Energy Promotion Project in Male), and the Scottish Government (Pre-Feasibility Study on Ocean Energy Implementation in the Maldives);
- World Bank (SREP – loan finance);
- ADB (SREP – loan finance and technical capacity building)

There are also a number of private sector initiatives underway to develop RE in the Maldives including:

- Development of a 600 kW waste-to-energy (WTE) project by an Indian company to gasify municipal solid waste from the Thilafushi landfill. Additional revenues from the project will be derived from the sale of certified emission credits from CDM;
- A proposal from a Chinese company for the development of a 50 MW wind power project near Male.

In conclusion, early activities of RETDAP were instrumental in catalyzing RE policy formulation and RE development in the Maldives. However, the lack of a full-time RETDAP project manager reduced the prominence of RETDAP after 2008; this was a primary factor contributing to the country's poor local RE technical capacity and general lack of public awareness on RE. These deficiencies will constrain the growth of RE opportunities in the Maldives.

5. ASSESSMENT OF MONITORING & EVALUATION SYSTEMS

5.1 M&E during Project Implementation

The use of a logical framework matrix (log-frame) is critical in defining the activities of GEF projects. For RETDAP, two versions of the RETDAP log-frame were used, the first one in 2004 and second one in 2007. Keeping in mind that these log-frames were designed in 1999 in the absence of any baseline energy data, project personnel were essentially forced into “guessing” end-of-project (EOP) targets, which create the optics of being poorly defined or overly ambitious. Examples include:

- In Project Goal and Objective: lack of specific targets such as “% share of RE in the energy mix”. This should not have been a project “target” given the difficulties in forecasting what would be a reasonable EOP target. The Project already had an EOP target of 260 kW of RE in hybrid systems which is in itself reasonable even though it was a “guess”; and
- On Outcome 5: an overly ambitious target of “processing of 40 applications” for FRESA loans. This could never have been achieved due to unrealistically high administration costs. An alternative target would have been a loan turnover rate over the project life.

PIRs were primarily used to report project progress. The information in the PIRs, however, was only sufficient to provide salient details of project progress, particularly in the latter years of the project (2007-11). This is likely due to the lack of dedicated project management personnel. Moreover, the Evaluator was unable to verify the quality of some project activities due to reports of these activities not being available including:

- Workshop and seminar proceedings;
- Reports on training workshops and surveys of trainees on their opinions of the quality of training received;
- Reports on the implementation and operations of the various pilot RE project systems including other hybrid systems (for solar-diesel and solar-wind), bio-digesters and solar desalination plants as setup by RETDAP. As such, the Evaluator has had to make conservative assumptions on the functionality of these pilots and their GHG reductions.

Ratings of the Project’s Monitoring and Evaluation system²³ are as follows:

- Quality of M&E design – MU. The targets of the log-frame for RETDAP (both in 2004 and 2007) required more clarity (considering the lack of baseline information) and more realistic targets;

²³ HS or Highly Satisfactory: There were no shortcomings in the project M&E system;
 S or Satisfactory: There were minor shortcomings in the project M&E system,
 MS or Moderately Satisfactory: There were moderate shortcomings in the project M&E system;
 MU or Moderately Unsatisfactory: There were significant shortcomings in the project M&E system;
 U or Unsatisfactory: There were major shortcomings in the project M&E system;
 HU or Highly Unsatisfactory: The Project had no M&E system

- *Quality of M&E implementation – MU.* This rating is a direct result of the quality of the log-frame, the resulting in difficulties in determining required concrete actions, and the subsequent lack of detailed reports of various activities.

5.2 Monitoring Long Term Changes

One of the outcomes of RETDAP should have been a monitoring, reporting and verification (MRV) system that can monitor the long-term effectiveness of RE development in the Maldives. However, no such system is in place.

An MRV system could be set up within a central government agency such as the CCED or STELCO to reduce the complexity and work required to track progress of RE projects expected in the more than 300 islands of the Maldives. With expected growth in the number of RE projects developed in the Maldives, the system could serve as a repository of web-based data of RE generation from the islands; an RE database can be setup to monitor and archive real-time RE generation for each RE project investment. More importantly, the database can be analyzed to calculate baseline energy consumptive information, renewable energy generated, GHG emission reductions after the RE investment, as well as project capital and operational costs. The information system can be operated on a user-friendly platform (such as Microsoft Access) that can easily produce reports.

The setup of an RE information system and database of this quality is inexpensive and highly recommended. Such a system would vastly improve the country's MRV capacities to report GHG reductions and increase the likelihood of monetizing Maldivian emission reductions to the carbon markets such as the EU-ETS. If such a system is set up, the GoM will need to assign a dedicated M&E officer to maintain and populate the database.

6. ASSESSMENT OF PROCESSES AFFECTING PROJECT OUTCOMES AND SUSTAINABILITY

6.1 Preparation and Readiness

When RETDAP became operational in mid-2005, it used a project design prepared in 1999. However, no PDF funds were utilized for the collection of baseline information; as previously mentioned in this report, the log-frame was never fully developed. Despite this shortcoming, the project did successfully demonstrate RE projects and a revolving RE fund mechanism, as well as raise RE awareness amongst government officials in the Maldives.

Up to 2007, the MCST/MEEW had provided good management of RETDAP activities. However, after 2007, a number of changes were made by the GoM in counterpart project personnel. This resulted in a lack of continuity in project management from 2007 to 2010, a critical period during which the project could not successfully achieve its objectives of building public awareness and local RE technical capacity.

6.2 Country Ownership and Drivenness

Since 2006, sustainable energy planning has become a mainstay of GoM development policy. This was reflected as early as the 6th National Development Plan that guides stakeholders “to plan and manage the provision and utilization of energy and the supply of electricity in the country” and “to minimize the dependency on imported sources of energy for generating power”. More recently, the 2010 Energy Policy and Strategy (where RETDAP and the SMILES project resources were instrumental in its formulation) articulates the GoM’s direction to “provide for developing greater sustainability, conservation and efficiency in energy whilst promoting low carbon technologies and the quality of energy supply”. The 7th National Development Plan (2009-13) envisages a 10-12% target share of RE in the energy supply mix with a more ambitious target of carbon neutrality by 2020 (also stated in the 2010 Energy Policy and Strategy).

These are clear demonstrations of the drivenness and commitment of the Government to the development of renewable energy in accordance with its development principles. The drivenness of the GoM, however, is somewhat tempered by its chronic staffing shortages limiting the pace of RE development. As such, the GoM will likely continue to need assistance to advance its progress towards the goal of carbon neutrality by 2020.

6.3 Stakeholder Involvement

The RETDAP project was aimed at building local technical capacity and raising awareness on RE technologies amongst end users, private sector and decision makers in government.

Involvement of decision makers in government, notably the Deputy Minister of Energy as the Project Director between 2005 and 2007, was a key factor to good progress attained by the Project during this period. High staff turnover and frequent changes in the GoM implementing partner between 2007 and 2010, however, resulted in declining government involvement and less prominence of RETDAP activities. This became an inhibiting factor to achieving public awareness and local technical capacity outcomes. By 2009, RETDAP management was stabilized with the assignment of three key government officers.

However, by 2009, more than 88% RETDAP technical assistance resources²⁴ had been expended limiting minimal government options to complete the Project.

The Project, however, has been instrumental in attracting the interest of six private sector entities through FRESA (of which four received approved loans). These entities were mainly entrepreneurs seeking opportunities to set up businesses in supplying and setting up RE equipment in the Maldives. The Project also increased the involvement of state entities, Maldives Gas and its parent company STO into investments in renewable energy. However, involvement of the private sector could have been improved if FRESA had been properly promoted. In addition, Project resources could have been used to increase the involvement of the tourism sector in RE development; this probably would have resulted in raising the profile of RE development in the Maldives.

Based on 2011 estimates by SREP that 25% of RE projects are not operational, there appears to be minimal involvement of end users in RE in island communities. Building local RE technical capacity is extremely important if RE generation on island communities is to be sustained; as such, there is an immediate need for a program to build capacity to service RE projects in island communities.

6.4 Financial Planning

Table 5 provides an overview of actual budget expenditures per component to the 31 December 2011. While RETDAP was planned as a 3-year project, financial planning was required for a 7-year period. Much of this was due to the late start-up of FRESA, which started in earnest in 2008 but was not completed until 2011 (due to lack of borrower interest). In addition, the need for assistance in RE policy development deferred Outcome 1 expenditures to 2008 and 2009. Notwithstanding the lack of a full-time Project Manager, delays in project completion added to project management costs estimated to be around 20% of the total project cost. Technical assistance expenditures from Outcomes 1 to 6 comprised 46% of the Project's expenditures while the FRESA fund of USD 250,000 was 33% of the total Project expenditures. The Outcome 4 expenditure of USD 116,207, is high (despite being the same amount as the original allocation) considering the intended outcomes of strengthened local RE technical capacity was not achieved.

6.5 Supervision and Backstopping by UNDP

Supervision and backstopping efforts by UNDP Maldives and the UNDP-GEF Regional office in Bangkok were marginally satisfactory. One area where RETDAP would have benefited from more UNDP supervision was completion of quantification deficiencies in its log-frame. The lack of quantified EOP indicators on the log-frame translated into difficulties in planning meaningful project activities such as targets for public awareness raising activities (Outcome 3), local technical capacity building (Outcome 4) and establishment of techno-economic feasibility of various RE technologies (Outcome 6). As such, a well-prepared log-frame would have improved the performance of the M&E aspects of the project. However, the difficulties of recruiting a full-time Project Manager during the 2007 to 2010 period only added to the difficulties of UNDP in supervising this project.

²⁴ TA resources is the total budget less the USD 250,000 seed capital for FRESA.

6.6 Co-Financing and Delays

The Project co-financing amounts were estimated to be in the order of USD 2.80 million, roughly four times the GEF allocation. This is detailed in Table 6 where actual co-financing is compared with planned co-financing from the 2004 Prodoc.

This project has experienced a number of delays in implementation since the Prodoc was signed in July 2004:

- The tsunami of December 2004 delayed the start-up of RETDAP to July 2005;
- The implementing agency was changed four times during the course of the 7-year project;
- Six project managers served on RETDAP. Each PM change was accompanied by several months of slow progress including a familiarization period with the project. With chronic staffing shortages, civil servants assigned to the Project after 2008 were also tasked with managing other RE initiatives that were being started by the GoM and other donor agencies. As such, downstream RETDAP activities such as building public awareness and local technical RE capacity were neglected leading to the failure of these activities to achieve their outcomes. This resulted in minimal government time and support to the project and delays to conclude the project;
- The slow start of FRESA from 2006. When FRESA became operational in 2008, no loans were approved due to high interest rates and poor promotion of the fund. In 2009, lower interest rates catalysed more loan applications. High administrative efforts, however, to approve the loans only delayed completion of the project until 2011 during which the fourth and final loan was approved by the FRESA Board.

Appendix D provides details of RETDAPs financial data under the prescribed UNPD-GEF format.

Table 5: Project Budget and Expenditures for 2004-2011 (in USD as of December 31, 2011)

Outcome	2004-05*	2006	2007	2008	2009	2010	2011 (up to 31 Dec 2011) ²⁵	Total Disbursed	Total Planned for Project	Total Remaining
Outcome 1: Development of RE policies, laws and regulations	4,937.53	-	-	-	3,011.76	6,200.49		14,149.78	44,063	
Outcome 2: RE resources in the Maldives assessed	4,142.00	-	111.37	1,065.18	-	6,765.57		12,084.12	13,678	
Outcome 3: Awareness of RE created and improved amongst users	23,081.00	5,361.95	112.55	1,762.35	1,350.00	5,597.88		37,265.73	56,501	
Outcome 4: Understanding of RE technology improved	272.33	16,009.52	42,121.63	56,439.22		1,364.62		116,207.31	116,443	
Outcome 5: Increase in RE finance and financial mechanisms	-	-	1,642.75	80,218.05	100,784.31	75,588.24	18,000.00	276,233.35	256,601	
Outcome 6: RE projects developed	81,822.02	21,324.77	2,083.39	137.25	17,535.80	1,394.51		124,297.75	122,213	
Project Management	23,147.16	16,199.24	13,180.00	19,743.92	8,171.17	-	64,320.48	144,761.95	115,501	
TOTAL (actual)	137,402.03	58,895.48	59,251.68	159,365.97	130,853.05	96,911.30	82,320.48	725,000.00	725,000	
TOTAL (cumulative actual)	137,402.03	196,297.15	255,549.19	414,915.16	545,768.21	642,679.51	725,000			
TOTAL (planned)	342,362²⁶	275,964	106,674	0	0	0	0	725,000	725,000	0
% expended of Total Planned Disbursement	19	27	35	57	75	89	100			

²⁵ Estimates only²⁶ USD 86,382 in 2004 and USD 255,981 in 2005

Table 6: Co-Financing and Leveraged Resources (in USD as of December 31, 2011)

Co financing (Type)	IA own Financing (mill US\$)		Multi-lateral Agencies (Non-GEF) (mill US\$)		Bilateral Donors (mill US\$)		Central Government (mill US\$)		Local Government (mill US\$)		Private Sector (mill US\$)		NGOs (mill US\$)		Total Financing (mill US\$)		Total Disbursement (mill US\$)	
	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual	Pro-posed	Actual
Grant	0.369	0.369 ²⁷		0.100 ²⁸		0.230 ²⁹	0.020	0.020							0.389	0.719	0.389	0.719
Credits																		
Loans																		
Equity									1.290	1.160 ³⁰	0.004	0.050 ³¹			1.294	1.210	1.294	1.210
In-kind				0.100 ³²			0.331	0.331 ³³							0.331	0.431	0.331	0.431
Non-grant Instruments																		
Other Types																		
TOTAL	0.369	0.369		0.200		0.230	0.351	0.351	1.290	1.160	0.004	0.050			2.014	2.360	2.014	2.360

²⁷ Includes USD 94,000 from UNDP Energy TTF; USD 175,000 from a UNOPS-Nordic Fund Project (SMILES); and USD 100,000 from TRAC funds. Funds were utilized on resource assessment and policy development activities (Outcomes 1 and 2)

²⁸ Estimated contribution from UNIDO for the fabrication and installation of 5 biogas digesters in 2009 and 2 solar desalination plants (100 liters/day) in early 2010

²⁹ USD 180,000 from ADEME-EU for the capital cost of the Mandhoo Island solar-hybrid system, and an estimated USD 50,000 from the Scottish Government for the study of ocean currents and OTEC by the Robert Gordon University of Aberdeen

³⁰ Value of STELCO participation on project over the entire project period

³¹ 20% equity as required for FRESA financing from 4 private sector companies in the Maldives

³² Estimated in-kind contribution from UNIDO for the professional time for the design and installation of 5 biogas digesters in 2009 and 2 solar desalination plants (100 liters/day) in early 2010

³³ This would include contributions from MHTE and MHE staff as well as administrative personnel from the Bank of Maldives.

7. LESSONS AND RECOMMENDATIONS

7.1 Lessons Learned

- The importance of obligating an RE equipment supplier to provide technical support for a project after installation. RETDAP had delivered strong technical assistance in identification of appropriate technologies, determination of energy savings, cost estimation, sourcing appropriate equipment and expertise, and installation of RE technologies, much of this through “learning-by-doing”. Based on the experiences of RETDAP demonstrations, most importantly, the Mandhoo Island solar-diesel hybrid pilot demonstration, a key lesson learned was the need to have an RE supplier provide technical support in the event of equipment malfunction. In the case of the Mandhoo Island solar-diesel hybrid pilot demonstration, the Mandhoo residents who were knowledgeable on the malfunctioned solar inverters were no longer available to take corrective actions since August 2011. Supply and installation of the solar facility should have been contingent on an O&M plan and technical support for a set number of years after completion of the project. Technical support should continue until knowledge transfers of the solar facility to local residents and a large central institution such as STELCO in Male are complete;
- The importance of data collection and analysis for RE projects. RETDAP did not develop any systems for the collection of baseline energy data and data of renewable energy generated. Long-term collection of energy data is extremely important as it provides more confidence to potential investors and project developers on the viability of RE investments. In addition, monitoring RE generation will also provide confidence of the economic and GHG reduction impacts of RE investments. This will improve the Government’s MRV functions on reporting of GHG emission reductions and will attract foreign assistance and investment into the Maldivian RE sector;
- Thorough preparations are required for the successful operation of a RE revolving fund: This would involve:
 - *identification of target groups with incentives to apply for loans.* In the case of RETDAP, FRESA revolving funds were initially targeted for RE investments by private households who did not have any incentives to convert to RE. For example, private households could not afford the high cost of solar panels, even with a FRESA loan amortized over a payback period of 5 years; the loan payments would have resulted in monthly payments greater than the monthly electricity payments for electricity. In 2008, FRESA’s first loan was approved for an entrepreneur to assist them in building an inventory of RE equipment leading to 3 more similar approved loans. An improved approach would have been to have FRESA funds financing specific RE technologies to meet government RE targets (e.g. 10% solar by 2015);
 - *availability of loan preparation assistance for borrowers.* Credit officers knowledgeable on RE technologies should have been trained to assist potential borrowers in preparing applications, advising them of procedures and eligibility requirements (notably on the types of technologies that can be financed) and repayment terms;
 - *ensuring the revolving fund has sufficient resources to cover banking administrative costs; to raise public awareness of the existence of the fund; and for turnover of a sufficient number of projects to raise the profile of RE*

technology deployment in the country. On RETDAP, administrative costs of the Bank of Maldives were in the order of 4 to 5%; there were no expenditures to advertise FRESA; and four loans to four entrepreneurs over 2.5 years are insufficient to raise the profile of a renewable energy in the Maldives with the public and the business community;

- ***Pilot projects must be holistically designed and managed.*** An appropriate design and implementation process was conducted for the Mandhoo Island solar-diesel hybrid pilot. This would include technology identification and sourcing appropriate expertise (long-term), estimation of capital costs and financial analysis (that included O&M), energy savings and building local capacity by allowing local residents to install the system. The pilot also demonstrated the need for dedicated O&M personnel to sustain generation of RE. The pilot had left a lasting impression on government officials on the deployment of small RE systems for small remote islands; the GoM has committed to replicating the Mandhoo demonstration through its funding of the six similar projects on six islands on the “Solar Maldives Program”;
- ***The successful launch of a national RE program requires:***
 - a thorough assessment of stakeholders and their commitments towards the project (expressed in terms of co-financing);
 - a proper assessment of local capacity and absorption for new technologies and practices, and the design of an appropriate RE capacity building program;
 - the promotion of RE technologies that have significant economic advantages to its users. This was not the case prior to 2008 when fossil-fuel generated electricity was more competitive than RE.

7.2 Recommendations

At this stage of RE development in the Maldives, the Government has a target towards carbon neutrality by 2020 that will be challenging to achieve and in need of detailed implementation plans. The key part of the Maldives energy strategy is a “cabinet-endorsed target to generate at least 60% of our electricity from solar power by 2020. The remaining 40% will be generated mainly with wind³⁴ and biomass, with some diesel remaining as back-up. The total investments needed to decarbonise the entire energy system is in the range of \$3 - \$5 billion over the next 10 years”³⁵. Assistance to the GoM is required towards meeting this target and to leveraging additional financial resources. Recommendations of this Final Evaluation are aimed at assisting the GoM in meeting its carbon neutrality targets for 2020:

Recommendation 1: Provide a detailed strategic plan to implement the Energy Strategy that contains prioritized actions with timelines and financing requirements.

In the Maldives today, there are a number of donor agencies prepared to assist the Maldives in its goals towards carbon neutrality by 2020. A framework for clean energy investments in the Maldives is being prepared with technical support from the Asian Development Bank (ADB). The framework document includes an overview of the energy

³⁴ According to the National Energy Policy and Strategy 2010 for the Maldives, wind energy is identified as one of the renewable energy sources to be developed. Wind energy in the Maldives can be mainly harnessed from the northern atolls with average wind speeds at 50 m height ranging from 4.0 to 8.3 m/s based on wind resource data collected from SMILES activities between 2003 and 2005. A number of wind energy projects are being proposed by the private sector in the Maldives, notably the 50 MW Hulhumale Project (near Male) by the Chinese wind company XEMC.

³⁵ <http://www.presidencymaldives.gov.mv/Index.aspx?lid=13&dcid=5983>

sector in the Maldives and greenhouse gas (GHG) emissions; defines the role for renewable energy technologies in the Maldives and barriers to its development; and provides recommendations on planning, regulation, institutional requirements and detailed studies to be undertaken to develop a complete investment plan for the energy sector. In the opinion of the Evaluator, the detailed strategic plan needs to include rapid development of RE projects to provide the critical momentum towards the achieving carbon neutrality. The strategic plan should:

- promote solar and wind resources for electricity generation as best RE options at this stage due to lower costs of the equipment, the availability of solar and wind resources throughout the Maldives and the relative simplicity of operating these technologies. One major technical issue that remains is the storing solar power for night use; currently battery banks are not only expensive but also environmentally costly. The GoM should seek foreign technical assistance to find appropriate and economic technologies for storage of grid solar power for night use. This would include promising long-term energy storage technologies that may become commercialized over the next 5 years including lithium-ion batteries, flow batteries and flywheels;
- establish the feasibility of household biogas digesters in the Maldives. Waste-to-energy (WTE) solutions were found to be feasible only in cases where the waste streams exceeded 15 tons per day³⁶. It is possible that some households do not generate sufficient biomass for biogas generation that would totally displace the use of propane or other fossil fuels for cooking. The concept of forming a cooperative where one digester serves a number of households should be investigated and scaled up if there is an economic advantage (after removal of fuel subsidies), sufficient TA funding to assist in deployment and community interest. This may also be attractive for island resorts using their own waste;
- provide details of how the government will utilize foreign assistance to overcome barriers to RE implementation. This would include actions to:
 - improve local capacity to assess, plan, implement and monitor RE development in the Maldives. This would include the setup of training facilities for trainers, RE engineers, project managers and auditors;
 - resolving lack of institutional clarity on the roles and responsibilities of promoting and implementing RE projects. At this time, much of the RE technical and implementation expertise in the Maldives appears to lie with the MHE, and its subordinate companies STELCO and Maldives Gas (see Recommendation 2 below);
 - strengthening and re-capitalization of FRESA to improve rate of adoption of RE technologies. The re-capitalization of FRESA, however, is a requirement if it is to evolve into a “one-stop facility” where viable RE technologies (that are sold by local RE entrepreneurs or foreign technology suppliers) can be promoted, and assistance provided to potential users to efficiently access financial resource resources.

Recommendation 2: Strengthen the institutional arrangements for Renewable Energy. The setup in its current form will not result in rapid deployment of technologies for RE electricity throughout the Maldives. The main issue in the institutional arrangement is the lack of incentive for personnel managing island utilities to reduce fossil fuel usage

³⁶ Environmental Research Center 2007

through renewable energy. To improve the adoption of adoption of renewable energy in the Maldives, the following actions are recommended:

- Prepare and implement a strategy that consolidates a fragmented power sector consisting of over 250 utility entities on 200 islands. This includes entities such as STELCO, Non Government Organizations (NGOs), Island Development Committees (IDCs) and Independent Power Producers (IPPs). All these utility entities are independently operated with minimal central oversight from STELCO and Atoll Administrations. Recent initiatives by the GoM have commenced a process of consolidating the power sector with the establishment of six regional utilities in addition to STELCO to provide electricity and other services including water and sewage. With the deployment of new technologies such as solar panels and inverters, an institution such as STELCO needs to be positioned as a national technology champion for renewable energy technologies (see Recommendation 3 on capacity building of STELCO). Their role can evolve into assisting island communities in the baseline data collection of power generation from diesel fuel on the islands; design and installation of solar equipment and other renewable energy technologies as deemed economical and appropriate; provision of operational assistance and technical support; and building local capacity to manage new hybrid generation facilities. A phased strategy is required to guide a 7-year growth period of STELCO that develops STELCO into an institution that effectively manages all island utilities. This would involve prioritizing islands for renewable energy development;
- Reform the Maldives Energy Authority (MEA) to more effectively regulate the energy sector towards carbon neutrality. Although the Maldives Energy Authority (MEA) is mandated to regulate the Maldivian energy sector, in practice, it only regulates the activities of STELCO and the six new regional utilities. MEA also issues licenses to power producers, sets electricity tariffs, and prepares engineering and regulatory codes and orders. MEA in its current form lacks the proper regulatory framework and legal mandate to effectively regulate the entire Maldivian energy sector as it transitions towards carbon neutrality;
- Setup an energy monitoring cell within MEA (under MHE) to monitor RE installations and resulting GHG reductions. This may involve setting up of data loggers within power generation facilities of each island utility. For hybrid facilities, solar and diesel electricity generation data needs to be segregated. To save on costly travel to the various islands to collect data, a real-time web-based data collection system can be setup in collaboration with the island communities. Such a system can provide important operational information that can be used to manage and troubleshoot remote RE projects as well as inform RE policy and potential RE investors. The system can also be used to demonstrate the commitment of the GoM to improving MRV systems for GHG monitoring. The local administration can manage the collection of energy information for the island that reports to a central government authority that reports to the monitoring cell and STELCO;

Recommendation 3: Build technical capacity to support project activities towards the goal of carbon neutrality by 2020: Technical assistance is required to:

- assist the Government of Maldives in formulating investment plans and proposals for foreign aid to facilitate investments and support in alternative energy projects in

the Maldives³⁷. With several new renewable energy and energy efficiency technologies being passed through various government departments, technical assistance is required to evaluate and accept RE proposals that are most appropriate for the Maldives in its quest to become carbon neutral by 2020;

- set up national standards for RE technologies and projects. Under a reformed MEA, minimal standards for RE generation using solar, wind and biomass resources needs to be set. This could include ISO standards or standards for solar and other renewable technologies under IEC. In addition, there should also be contractual standards set for RE equipment installation contractors that defines their scope of services, payment modalities and arbitration rules;
- strengthen STELCO capacity as national technology champion on RE for island grids. Using the syllabus developed under RETDAP for the Polytechnique course on “Renewable Energy Systems and Maintenance”, STELCO trainers can be trained on the design, installation, operation and maintenance of renewable energy systems, as well as O&M of small grids. These STELCO trainers, in turn, can then provide in-country training of other utility technicians in the Maldives, notably communities outside of Male. Currently, there are no such training courses in the Maldives;
- improving national MRV capacity for GHG monitoring. Technical assistance should be provided to MEA (under MHE) to improve their monitoring, reporting and verification capacities on diesel fuel consumption and offsetting renewable energy generation. If there is value-added, the methodologies for determining emission reductions can be set up using a “Gold Standard” that provides high quality carbon credits with premium value.

Recommendation 4: Financing future RE projects through a re-branded FRESA:

This would entail the selection of one of three options for the future of the FRESA financing scheme³⁸:

- Option 1: Integrate the existing FRESA scheme into a new, larger “Maldives Green/Eco Fund”. This option will be, however, politically a more difficult option to implement as compared to the options 2 and 3. Essentially, the idea would be to develop and implement a fund, which provides financial support to projects in the areas renewable energy, energy efficiency, biodiversity and waste management. UNDP together with the Ministry of Housing and Environment could take a lead in developing the feasibility study for the proposed new Fund. As part of this study, it would be necessary to elaborate the enabling legislation for the Fund, its revenues as well as all operational procedures and policies.
- Option 2: Continue FRESA as a self-standing fund with improved procedures. If Option 1 is not feasible due to political or public finance concerns, this is the next-best option. Option 2 two would essentially consist of improving the current operational procedures of FRESA in line with previous concerns in this evaluation

³⁷ In May 2011, the Cabinet announced it would establish a Renewable Energy Investment Office (under the Ministry of Economic Development) to formulate economic solutions to improve energy security of the Maldives concerns and expedite implementation of these solutions. In addition, this office will find and apply appropriate alternative energy solutions and assist regional utility companies in seeking investments and capacity building in the area of renewable energy technologies. The Evaluator notes, however, that there are officers within the chronically understaffed MHE who have excellent RE technical capacity and are managing the GoM-funded “Solar Maldives Program”. Hence, future technical assistance programs will need to identify the appropriate agencies for capacity building.

³⁸ Æquilibrium Consulting GmbH, “Evaluation of FRESA (Fund for Renewable Energy System Applications)”, 12 December 2011

and that of the “Evaluation of FRESA” to significantly recapitalize and increase FRESA. One possibility that will require further assessment is linking FRESA with the Laamu Atoll Development, a UNDP-project initiative funded by DANIDA. Since one-third of this project’s funds are for renewable energy development, a portion of these funds could be used to re-capitalize FRESA;

- Option 3: Discontinue FRESA in the event that Options 1 and 2 as detailed above cannot be implemented and the fund cannot be significantly recapitalized and increased. In this scenario, it would be necessary to elaborate and agree on an arrangement on what will happen to the loan capital that will eventually be paid back latest 8-9 years from now. Essentially, the question is whether the money stays with the Bank of Maldives or will be transferred back to the Ministry of Finance or Ministry of Environment and Housing or UNDP and under which conditions such transactions will be executed. UNDP, as part of the project committee should negotiate with the MFT, MHE and the Bank of Maldives on the exact modalities of terminating FRESA and use of paid back loans.

In the opinion of the Evaluator, Option 2 has the best potential for re-capitalization of FRESA since the Laamu Project has been approved by the GoM. FRESA design and operational procedures will also need to be improved to:

- ensure there are sufficient resources for fund promotional activities;
- provide technical assistance for borrowers;
- lend primarily to entrepreneurs to develop the local “green” industry that will contribute to economic growth and generate new employment in the area. With the development of this domestic industry in the areas of renewables, energy efficiency and waste management technology, valuable expertise can be developed for the maintenance and repair of these technologies;
- link with the MEA monitoring cell and its improved MRV capacity to report on the Fund’s achievements in GHG reductions on its RE and EE loans; and
- serve as a vehicle to attract other sources of capitalization. This would include climate funds, Gold Standard carbon credits, and philanthropy. The GoM can even consider diversion of diesel fuel subsidies and the deposit of green taxes on resorts and other tourism sector transactions such as souvenir sales, merchandise and diving schools.

Recommendation 5: Provide assistance on determination of best technologies for small island grids to become carbon neutral. Battery banks to store solar energy for night use has proven to be too costly using 2006 or 2011 battery technology. Furthermore, since lead acid batteries have a service life of 4 to 5 years, battery banks must be replaced at a leading to a disposal problem of these batteries over the long term, and adding more than \$0.20 per installed kilowatt hour generated. With improvements in battery technology expected over the next few years, the GoM should be apprised of such developments should they become more cost effective. This would include promising long-term energy storage technologies that may become commercialized over the next 5 years including lithium-ion batteries, flow batteries and flywheels

Recommendation 6: Improve participation of the tourism sector in RE development. To date, the involvement of the island resorts in RE development has been minimal. Given that the tourism sector consumes more than 32% of the country’s primary energy

resources, the GoM needs to have a collaborative approach with the industry to contribute to the vision of carbon neutrality by 2020. A pilot project to implement RE development for a selected resort may be the catalyst required for RE development in the sector. Given the possible large investments required for carbon neutrality on resorts, a pilot may be implemented in a phased approach in line with milestones set by the GoM on RE development up to 2020. Moreover, marketing of carbon neutral resorts could accelerate the rate of RE adoption by all resorts in the Maldives.

APPENDIX A – MISSION TERMS OF REFERENCE FOR PROJECT FINAL EVALUATION

RENEWABLE ENERGY TECHNOLOGY DEVELOPMENT ADAPTATION PROJECT (RETDAP)

A. Background and Context

The Renewable Energy Technology Development and Application Project (RETDAP), is the first initiative to address RE in the country. The project is co-financed with the Global Environment Facility (GEF) and implemented by the UNDP and executed by the Ministry of Environment, Science and Technology. The development goal of this project the reduction of the growth rate of GHG emissions from fossil fuel using activities, particularly diesel power generation through the removal of the major barriers to the development and application of renewable energy-based systems that can supplant part of the fossil fuel use in the Maldives. The project will quantify and evaluate the potentials of available renewable energy (RE) resources in the country for electricity and non-electricity

B. Evaluation Purpose

The RETDAP was scheduled for completion on 30 December 2010, however due to delay we now aiming to complete the evaluation before the end of 2011. UNDP-GEF policy requires that an independent terminal evaluation take place three months prior to the final Project Board meeting. The terminal evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The terminal evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits. The main stakeholders of the evaluation include:

- The Global Environment Facility (GEF)
- Maldives Country Office of UNDP
- Ministry of Housing and Environment

I. Evaluation Scope and Objectives

The terminal evaluation of the RETDAP Project should properly examine and assess the perspectives of the various stakeholders. The following areas should be covered in the terminal evaluation report:

1. General Information about the Evaluation

The terminal evaluation report should include information on when the evaluation took place; places visited; who was involved; the key questions; and, the methodology. The terminal evaluation report will also include the evaluation team's TOR and any response from the project management team and/or the country focal point regarding the evaluation findings or conclusions as an annex to the report.

2. Assessment of Project Results

The terminal evaluation will assess achievement of the project's objective, outcomes and outputs and will provide ratings for the targeted objective and outcomes. The assessment of project results seeks to determine the extent to which the project objective was achieved, or is expected to be achieved, and assess if the project has led to any other short term or long term and positive or negative consequences. While assessing a project's results, the terminal evaluation will seek to determine the extent of achievement and shortcomings in reaching the project's objective as stated in the project document and also indicate if there were any changes and whether those changes were approved. If the project did not establish a baseline (initial conditions), the evaluator should seek to estimate the baseline condition so that achievements and results can be properly established.

Assessment of project outcomes should be a priority. Outcomes are the likely or achieved short-term and medium-term effects of an intervention's outputs. Examples of outcomes could include but are not restricted to stronger institutional capacities, higher public awareness (when leading to changes of behavior), and transformed policy frameworks or markets. An assessment of impact is encouraged when appropriate. The evaluator should assess project results using indicators and relevant tracking tools.

To determine the level of achievement of the project's objective and outcomes, the following three criteria will be assessed in the terminal evaluation:

- **Relevance:** Were the project's outcomes consistent with the focal areas/operational program strategies and country priorities?
- **Effectiveness:** Are the actual project outcomes commensurate with the original or modified project objective?
- **Efficiency:** Was the project cost effective? Was the project the least cost option? Was the project implementation delayed and if it was, then did that affect cost effectiveness? Wherever possible, the evaluator should also compare the costs incurred and the time taken to achieve outcomes with that of other similar projects.

The evaluation of relevancy, effectiveness and efficiency will be as objective as possible and will include sufficient and convincing empirical evidence. Ideally the project monitoring system should deliver quantifiable information that can lead to a robust assessment of the project's effectiveness and efficiency. Outcomes will be rated as follows for relevance, effectiveness and efficiency:

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

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

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

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

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

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

When rating the project's outcomes, relevance and effectiveness will be considered as critical criteria. If separate ratings are provided on relevance, effectiveness and efficiency, the overall outcomes rating of the project may not be higher than the lowest rating on relevance and effectiveness. Thus, to have an overall satisfactory rating for outcomes, the project must have at least satisfactory ratings on both relevance and effectiveness.

The evaluators will also assess other results of the project, including positive and negative actual (or anticipated) impacts or emerging long-term effects of a project. Given the long term nature of impacts, it might not be possible for the evaluators to identify or fully assess impacts. Evaluators will nonetheless indicate the steps taken to assess long-term project impacts, especially impacts on local populations, global environment (e.g. reduced greenhouse gas emissions), replication effects and other local effects. Wherever possible, evaluators should indicate how the findings on impacts will be reported to the GEF in future.

3. Assessment of Risks to Sustainability of Project Outcomes

The terminal evaluation will assess the likelihood of sustainability of outcomes at project termination, and provide a rating for this. Sustainability will be understood as the likelihood of continued benefits after the GEF project ends. The sustainability assessment will give special attention to analysis of the risks that are likely to affect the persistence of project outcomes. The sustainability assessment should explain how the risks to project outcomes will affect continuation of benefits after the GEF project ends. It will include both exogenous and endogenous risks. The following four dimensions or aspects of risks to sustainability will be addressed:

- **Financial risks:** Are there any financial risks that may jeopardize sustainability of project outcomes? What is the likelihood of financial and economic resources not being available once the GEF assistance ends (resources can be from multiple sources, such as the public and private sectors, income generating activities, and trends that may indicate that it is likely that in future there will be adequate financial resources for sustaining the project's outcomes)?
- **Socio-political risks:** Are there any social or political risks that may jeopardize sustainability of project outcomes? What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that the project benefits continue to flow? Is there sufficient public / stakeholder awareness in support of the long term objectives of the project?
- **Institutional framework and governance risks:** Do the legal frameworks, policies and governance structures and processes within which the project operates pose risks that may jeopardize sustainability of project benefits? Are requisite systems for accountability and transparency, and required technical know-how, in place?

- **Environmental risks:** Are there any environmental risks that may jeopardize sustainability of project outcomes? The terminal evaluation should assess whether certain activities will pose a threat to the sustainability of the project outcomes.

Each of the above dimensions of risks to sustainability of project outcomes will be rated based on an overall assessment of the likelihood and magnitude or the potential effect of the risks considered within that dimension. The following ratings will be provided:

Likely (L): There are no or negligible risks that affect this dimension of sustainability.

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

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

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

All the risk dimensions of sustainability are critical. Therefore, the overall rating for sustainability will not be higher than the lowest rated dimension. For example, if a project has an 'Unlikely' rating in any dimension, then its overall rating cannot be higher than 'Unlikely'.

4. Catalytic Role

The terminal evaluation will also describe any catalytic or replication effect of the project. If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the catalytic role.

5. Assessment of Monitoring and Evaluation System

The terminal evaluation will assess whether the project met the minimum requirements for project design of M&E and the implementation of the project M&E plan. GEF projects must budget adequately for execution of the M&E plan, and provide adequate resources during implementation of the M&E plan. Project managers are also expected to use the information generated by the M&E system during project implementation to adapt and improve the project. Given the long duration of many GEF interventions, projects are also encouraged to include long-term monitoring provisions to measure mid-term and long-term results (such as global environmental effect, replication effects, and other local effects) after project completion. The terminal evaluation report will include separate assessments of the achievements and shortcomings of the project M&E plan and of implementation of the M&E plan.

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

M&E plan implementation. The terminal evaluation should verify that: an M&E system was in place and facilitated timely tracking of progress towards the project objective and outcomes by collecting information on chosen indicators continually throughout the project implementation period; annual project reports were complete, accurate and with well justified ratings; the

information provided by the M&E system was used during the project to improve performance and to adapt to changing needs; and, the project had an M&E system in place with proper training for parties responsible for M&E activities to ensure data will continue to be collected and used after project closure.

Budgeting and funding for M&E Activities. In addition to incorporating information on funding for M&E while assessing M&E design, the evaluators will determine whether M&E was sufficiently budgeted for a the project planning stage and whether M&E was funded adequately and in a timely manner during implementation.

Project monitoring and evaluation systems will be rated as follows on quality of M&E design and quality of M&E implementation:

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

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

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

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

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

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

The overall rating of M&E during project implementation will be based solely on the quality of M&E plan implementation. The ratings on quality at entry of M&E design and sufficiency of funding both during planning and implementation stages will be used as explanatory variables.

6. Monitoring of Long-Term Changes

The monitoring and evaluation of long-term changes is often incorporated in GEF supported projects as a separate component and it may include determination of environmental baselines, specification of indicators, provisioning of equipment and capacity building for data gathering, analysis and use. This section of the terminal evaluation report will describe project actions and accomplishments toward establishing a long-term monitoring system. The review will address the following questions:

Did this project contribute to the establishment of a long-term monitoring system? If it did not, should the project have included such a component?

What were the accomplishments and shortcomings in establishment of this system?

Is the system sustainable – that is, is it embedded in a proper institutional structure and does it have financing?

Is the information generated by this system being used as originally intended?

7. Assessment of Processes that Affected Attainment of Project Results

When relevant, the evaluation team should consider the following issues affecting project implementation and attainment of project results. Note that evaluators are not expected to provide ratings or separate assessments on these issues, but these could be considered in the performance and results sections of the report:

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

Country ownership/drivenness. Was the project concept in line with the sectoral and development priorities and plans of the country? Are project outcomes contributing to national development priorities and plans? Were the relevant country representatives, from government and civil society, involved in the project? Did the recipient government maintain its financial commitment to the project? Has the government approved policies or regulatory frameworks that are in line with the project's objectives?

Stakeholder involvement. Did the project involve the relevant stakeholders through information sharing, consultation and by seeking their participation in the project's design, implementation, and monitoring and evaluation? For example, did the project implement appropriate outreach and public awareness campaigns? Did the project consult with and make use of the skills, experience and knowledge of the appropriate government entities, NGOs, community groups, private sector, local governments and academic institutions in the design, implementation and evaluation of project activities? Were perspectives of those who would be affected by project decisions, those who could affect the outcomes and those who could contribute information or other resources to the process taken into account while taking decisions? Were the relevant vulnerable groups and powerful supporters and opponents, of the processes properly involved? Gender perspective: To what extent did the project account for gender differences when developing and applying project interventions? How were gender considerations mainstreamed into project interventions?

Financial planning. Did the project have the appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Was there due diligence in the management of funds and financial audits? Did promised co-financing materialize? **(Please complete the co-financing table in Annex 1).**

GEF Agency supervision and backstopping. Did UNDP staff identify problems in a timely fashion and accurately estimate their seriousness? Did UNDP staff provide quality support and advice to the project, approve modifications in time and restructure the project when needed? Did UNDP provide the right staffing levels, continuity, skill mix, and frequency of field visits for the project?

Co-financing and Project Outcomes and Sustainability. If there was a difference in the level of expected co-financing and the co-financing actually realized, what were the reasons for the variance? Did the extent of materialization of co-financing affect the project's outcomes and/or sustainability, and if so, in what ways and through what causal linkages?

Delays and Project Outcomes and Sustainability. If there were delays in project implementation and completion, what were the reasons? Did the delays affect the project's outcomes and/or sustainability, and if so, in what ways and through what causal linkages?

8. Lessons and Recommendations

The evaluators will present lessons and recommendations in the terminal evaluation report on all aspects of the project that they consider relevant. The evaluators will be expected to give special attention to analyzing lessons and proposing recommendations on aspects related to factors that contributed to or hindered: attainment of project objective, sustainability of project benefits, innovation, catalytic effect and replication, and project monitoring and evaluation.

Evaluators should refrain from providing recommendations to improve the project. Instead they should seek to provide a few well formulated lessons applicable to the type of project at hand or to GEF's overall portfolio. Terminal evaluations should not be undertaken with the motive of appraisal, preparation, or justification, for a follow-up phase. Wherever possible, the terminal evaluation report should include examples of good practices for other projects in a focal area, country or region.

Methodology

An outline of an evaluation approach is provided below; however, the evaluation team is responsible for revising the approach as necessary. The evaluation must provide evidence-based information that is credible, reliable and useful. It must be easily understood by project partners and applicable to the remaining period of project duration.

The evaluation should provide as much gender disaggregated data as possible.

The methodology to be used by the evaluation team should be presented in the report in detail. It shall include information on:

- Documentation review (desk study) - the list of documentation to be reviewed is included in Annex 3 of the Terms of Reference;
- Meetings will be held with the UNDP The Maldives, project team and key stakeholders
- Field visits;
- Questionnaires, participatory techniques and other approaches for the gathering and analysis of data.

It is anticipated that the evaluation team would have completed most of its desk review prior to the field mission. The team shall use the time during the field mission to verify and cross check its analysis and assessment before conducting the stakeholder workshop and presenting preliminary results.

IV. Products expected from the evaluation

The key product expected from the evaluation is a comprehensive analytical report. The length of the terminal evaluation report shall not exceed 50 pages in total (not including annexes). The report shall be submitted to the UNDP The Maldives CO. See Annex 2 for a suggested outline of the report.

Deliverable	
Presentation by evaluators to project stakeholders on overview of the terminal evaluation, the methodology applied, progress to date, the anticipated outcomes, and some preliminary results if possible.	
Completion of stakeholder consultations	
Draft terminal evaluation report that adheres to the outline and structure as provided in Annex 2. The draft report will be circulated among key stakeholders for their review and feedback.	
Final terminal evaluation report that incorporates feedback and recommendations from the stakeholders.	

Evaluation Team Composition and Required Competencies

A team of independent experts will conduct the evaluation. 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 evaluation team will be composed of one International Consultant or team leader and one National Consultant. The consultants shall have prior experience in evaluating energy efficiency and climate change projects.

Team Qualities:

a. For International Consultant

The ideal candidate shall have the following minimum qualifications and experience;

- Master's degree in economics, project management, public administration, environmental sciences and relevant fields.
- At least ten (10) years of international experience in the areas of project development, project implementation, and project evaluation for donor-funded development projects in developing countries.
- Recent experience with results-based management evaluation methodologies;
- Experience applying participatory monitoring approaches;
- Recent knowledge of GEF Monitoring and Evaluation Policy;
- Recent knowledge of UNDP's results-based evaluation policies and procedures;
- Demonstrable analytical skills;
- Good interpersonal skills and ability to work under diverse/varied cultural environments;
- Project evaluation experience within the UN system will be considered an asset;
- Demonstrated command over writing professional reports in English. Familiarity with The Maldivese language will be considered an advantage.

Specifically, the international expert (team leader) will perform the following tasks:

- Lead and manage the evaluation mission;
- Design the detailed evaluation scope and methodology (including the methods for data collection and analysis);
- Decide the division of labor within the evaluation team;
- Conduct an analysis of the outcome, outputs and partnership strategy (as per the scope of the evaluation described above);
- Draft related parts of the evaluation report; and
- Finalize the entire evaluation report.

b. For Local Consultant

The ideal candidate shall have the following minimum qualification and experience;

- Citizen of The Maldives by birth;
- At least five (5) years of experience in the areas of project development, project implementation, and project evaluation for donor-funded development projects in The Maldives;
- Familiarity and past experience with evaluation of UNDP projects, especially energy efficiency projects, will be an advantage;
- Good interpersonal skills;
- Demonstrated command over writing professional reports in English;
- Native fluency in spoken and written The Maldivese language;
- Command over spoken and written English languages.

Evaluations in UNDP will be conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluation'.³⁹ Moreover, the evaluation will be undertaken in-line with GEF principles:

- Independence
- Impartiality
- Transparency
- Disclosure
- Ethical
- Partnership
- Competencies and Capacities
- Credibility
- Utility

Implementation Arrangements

UNDP CO in Maldives will be responsible for selection and procurement of both international and local consultants. The international consultant will be the team leader and responsible for overall planning, execution and quality, contents and timely completion of the deliverables. Upon selection and procurement of international and local consultants, the UNDP CO in The Maldives shall coordinate the initial communication between the two consultants and PMU, after which the international consultant shall assume the leadership role.

The Head of Sustainable Cluster at UNDP Country Office in The Maldives will be the overall supervisor for this assignment, and the evaluation team leader will report to him/her. The Program Officer (PO) nominated by the cluster head will be responsible for all coordination activities. However, all logistical arrangements (transport, accommodation, communications, visa, arranging meetings, supplying copies of required documentation, etc.) to support evaluation team will be the responsibility of PMU. The PMU will also be responsible for organizing the stakeholder workshop and coordinating the feedback from stakeholders and delivering the feedback to the TE team.

³⁹UNEG, 'Ethical Guidelines for Evaluation', June 2008. Available at <http://www.uneval.org/search/index.jsp?q=ethical+guidelines>.

With the exception of a 1 week field mission, the members of the TE team are expected to work mostly from their home based offices and communicate among themselves and with UNDP, PMU and other stakeholders electronically. The evaluation team can seek out both PO UNDP and PMU for reasonable assistance and support that they may require to fulfill their responsibilities.

V. Timeframe for the Evaluation Process

The following time schedule is anticipated for this assignment;

Task	Expected Dates
1. Selection and Procurement of Consultants	
2. Supply of Project Documents and Desk Review	
3. First remote coordination conference	
4. Field Mission and Stakeholder Workshop	
5. Draft Report	
6. Final Report	

Selection Procedure

Interested professionals, who meet the qualification criteria above, are requested to email their detailed CVs supported by 1 page A4 size cover letter containing textual justification for their selection, to

E-mail address. In the subject of email please type; “Terminal Evaluation VEEPLP – [International or Local, whichever is applicable] Consultant”.

UNDP CO shall evaluate all applications on the basis of procurement process approved by the UNDP. UNDP CO The Maldives shall contact the top ranking applicants to negotiate remunerations and other terms of contract.

Annex 1: Required Project Identification and Financial Data

The terminal evaluation report should provide information on project identification, time frame, actual expenditures, and co-financing in the following format, which is modeled after the project identification form (PIF).

I. Project Identification

GEF Project ID: [Assigned by the GEF Secretariat at pipeline entry.]

GEF Agency Project ID:

Countries:

Project Title: [As per the project appraisal document submitted to the GEF.]

GEF Agency (or Agencies):

II. Dates

Milestone	Expected date	Actual date
CEO endorsement/approval		
Agency approval date		
Implementation start		
Midterm evaluation		
Project completion		
Terminal evaluation completion		
Project closing		

III. Project Framework

Project component	Activity type	GEF financing (in \$)		Cofinancing (in \$)	
		Approved	Actual	Promised	Actual
1.					
2.					
3.					
4.					
5.					
6. Project management					
Total					

Activity types are investment, technical assistance, or scientific and technical analysis.

Promised co financing refers to the amount indicated at the point of CEO endorsement/approval.

IV. Co financing

Sources of Cofinancing	Type	Project preparation		Project implementation		Total	
		Expected	Actual	Expected	Actual	Expected	Actual
Host gov't contribution							
GEF Agency (ies)							
Bilateral aid agency (ies)							
Multilateral agency (ies)							
Private sector							
NGO							
Other							
Total Cofinancing							

Expected amounts are those submitted by the GEF Agencies in the original project appraisal document.

Co-financing types are grant, soft loan, hard loan, guarantee, in kind, or cash.

Annex 2: Evaluation report template and quality standards

This evaluation report template is intended to serve as a guide for preparing meaningful, useful and credible evaluation reports that meet quality standards. It does not prescribe a definitive section-by-section format that all evaluation reports should follow. Rather, it suggests the content that should be included in a quality evaluation report. The descriptions that follow are derived from the UNEG ‘Standards for Evaluation in the UN System’ and ‘Ethical Standards for Evaluations’.

The evaluation report should be complete and logically organized. It should be written clearly and understandable to the intended audience. In a country context, the report should be translated into local languages whenever possible. The report should also include the following:

Title and opening pages—Should provide the following basic information:

- Name of the evaluation intervention
- Timeframe of the evaluation and date of the report
- Countries of the evaluation intervention
- Names and organizations of evaluators
- Name of the organization commissioning the evaluation
- Acknowledgements

Table of contents—Should always include boxes, figures, tables and annexes with page references.

List of acronyms and abbreviations

Executive summary—A stand-alone section of two to three pages that should:

- Briefly describe the intervention (the project(s), programme(s), policies or other interventions) that was evaluated.
- Explain the purpose and objectives of the evaluation, including the audience for the evaluation and the intended uses.
- Describe key aspect of the evaluation approach and methods.
- Summarize principle findings, conclusions, and recommendations.
-

Introduction—Should:

- Explain why the evaluation was conducted (the purpose), why the intervention is being evaluated at this point in time, and why it addressed the questions it did.
- Identify the primary audience or users of the evaluation, what they wanted to learn from the evaluation and why, and how they are expected to use the evaluation results.
- Identify the intervention (the project(s) programme(s), policies or other interventions) that was evaluated—see upcoming section on intervention.
- Acquaint the reader with the structure and contents of the report and how the information contained in the report will meet the purposes of the evaluation and satisfy the information needs of the report’s intended users.

Description of the intervention—Provides the basis for report users to understand the logic and assess the merits of the evaluation methodology and understand the applicability of the evaluation results. The description needs to provide sufficient detail for the report user to derive meaning from the evaluation. The description should:

- Describe what is being evaluated, who seeks to benefit, and the problem or issue it seeks to address.
- Explain the expected results map or results framework, implementation strategies, and the key assumptions underlying the strategy.
- Link the intervention to national priorities, UNDAF priorities, corporate multiyear funding frameworks or strategic plan goals, or other programme or country specific plans and goals.
- Identify the phase in the implementation of the intervention and any significant changes (e.g., plans, strategies, logical frameworks) that have occurred over time, and explain the implications of those changes for the evaluation.
- Identify and describe the key partners involved in the implementation and their roles.
- Describe the scale of the intervention, such as the number of components (e.g., phases of a project) and the size of the target population for each component.
- Indicate the total resources, including human resources and budgets.
- Describe the context of the social, political, economic and institutional factors, and the geographical landscape within which the intervention operates and explain the effects (challenges and opportunities) those factors present for its implementation and outcomes.
- Point out design weaknesses (e.g., intervention logic) or other implementation constraints (e.g., resource limitations).

Evaluation scope and objectives—The report should provide a clear explanation of the evaluation’s scope, primary objectives and main questions.

- **Evaluation scope**—The report should define the parameters of the evaluation, for example, the time period, the segments of the target population included, the geographic area included, and which components, outputs or outcomes were and were not assessed.
- **Evaluation objectives**—The report should spell out the types of decisions evaluation users will make, the issues they will need to consider in making those decisions, and what the evaluation will need to achieve to contribute to those decisions.
- **Evaluation criteria**—The report should define the evaluation criteria or performance standards used. The report should explain the rationale for selecting the particular criteria used in the evaluation.
- **Evaluation questions**—Evaluation questions define the information that the evaluation will generate. The report should detail the main evaluation questions addressed by the evaluation and explain how the answers to these questions address the information needs of users.

Evaluation approach and methods—The evaluation report should describe in detail the selected methodological approaches, methods and analysis; the rationale for their selection; and how, within the constraints of time and money, the approaches and methods employed yielded data that helped answer the evaluation questions and achieved the evaluation purposes. The description should help the report users judge the merits of the methods used in the evaluation and the credibility of the findings, conclusions and recommendations. The description on methodology should include discussion of each of the following:

- **Data sources**—The sources of information (documents reviewed and stakeholders), the rationale for their selection and how the information obtained addressed the evaluation questions.
- **Sample and sampling frame**—If a sample was used: the sample size and characteristics; the sample selection criteria (e.g., single women, under 45); the process for selecting the sample (e.g., random, purposive); if applicable, how comparison and treatment groups were assigned; and the extent to which the sample is representative of the entire target population, including discussion of the limitations of the sample for generalizing results.

- **Data collection procedures and instruments**—Methods or procedures used to collect data, including discussion of data collection instruments (e.g., interview protocols), their appropriateness for the data source and evidence of their reliability and validity.
- **Performance standards**—The standard or measure that will be used to evaluate performance relative to the evaluation questions (e.g., national or regional indicators, rating scales).
- **Stakeholder engagement**—Stakeholders' engagement in the evaluation and how the level of involvement contributed to the credibility of the evaluation and the results.
- **Ethical considerations**—The measures taken to protect the rights and confidentiality of informants (see UNEG 'Ethical Guidelines for Evaluators' for more information).
- **Background information on evaluators**—The composition of the evaluation team, the background and skills of team members and the appropriateness of the technical skill mix, gender balance and geographical representation for the evaluation.
- **Major limitations of the methodology**—Major limitations of the methodology should be identified and openly discussed as to their implications for evaluation, as well as steps taken to mitigate those limitations.

Data analysis—The report should describe the procedures used to analyse the data collected to answer the evaluation questions. It should detail the various steps and stages of analysis that were carried out, including the steps to confirm the accuracy of data and the results. The report also should discuss the appropriateness of the analysis to the evaluation questions. Potential weaknesses in the data analysis and gaps or limitations of the data should be discussed, including their possible influence on the way findings may be interpreted and conclusions drawn.

Findings and conclusions—The report should present the evaluation findings based on the analysis and conclusions drawn from the findings.

- **Findings**—Should be presented as statements of fact that are based on analysis of the data. They should be structured around the evaluation criteria and questions so that report users can readily make the connection between what was asked and what was found. Variances between planned and actual results should be explained, as well as factors affecting the achievement of intended results. Assumptions or risks in the project or programme design that subsequently affected implementation should be discussed.
- **Conclusions**—Should be comprehensive and balanced, and highlight the strengths, weaknesses and outcomes of the intervention. They should be well substantiated by the evidence and logically connected to evaluation findings. They should respond to key evaluation questions and provide insights into the identification of and/or solutions to important problems or issues pertinent to the decision making of intended users.

Recommendations—The report should provide practical, feasible recommendations directed to the intended users of the report about what actions to take or decisions to make. The recommendations should be specifically supported by the evidence and linked to the findings and conclusions around key questions addressed by the evaluation. They should address sustainability of the initiative and comment on the adequacy of the project exit strategy, if applicable.

Lessons learned—As appropriate, the report should include discussion of lessons learned from the evaluation, that is, new knowledge gained from the particular circumstance (intervention, context outcomes, even about evaluation methods) that are applicable to a similar context. Lessons should be concise and based on specific evidence presented in the report.

Report annexes—Suggested annexes should include the following to provide the report user with supplemental background and methodological details that enhance the credibility of the report:

- ToR for the evaluation
- Additional methodology-related documentation, such as the evaluation matrix and data collection instruments (questionnaires, interview guides, observation protocols, etc.) as appropriate
- List of individuals or groups interviewed or consulted and sites visited
- List of supporting documents reviewed
- Project or programme results map or results framework
- Summary tables of findings, such as tables displaying progress towards outputs, targets, and goals relative to established indicators
- Short biographies of the evaluators and justification of team composition
- Code of conduct signed by evaluators

Annex 3: List of documentation to be reviewed

The TE team will be supplied with the following project documents and outputs for team members to familiarize themselves with core concepts and design of the project and conduct the initial desk review. The team will be assisted by both PMU and UNDP CO to provide additional information or clarification associated with these documents.

- Original project document, “The Maldives Energy Efficient Public Lighting Project” (1 MS Word File)
- Mid Term Evaluation Report (1 MS Word File)
- Revised project log frame “Revised Annual Targets” (1 MS Word File)
- Revised project target indicators (1 MS Word File)
- Action plan to implement MTE recommendations (1 MS Word File)
- Annual Work Plans (4 MS Excel Files)
- Quarterly Work Plans (20 MS Excel Files)
- Annual Progress Reports (4 MS Word Files)
- Project Implementation Review (PIR) Reports (3 MS Word Files, 1 MS Excel Files)
- VEEPLP Website at www.veepl.vast.ac.vn
- Selected Subcontract reports (20)
- A comprehensive list of key documents/outputs produced by the project (1 MS Word File)

The TE team can use the last item in the above list to demand copies of any other documents or project outputs, which it may find useful to complete its tasks as described in this TOR. The soft copies of the required documents shall be supplied within 2 working days from the date of request.

APPENDIX B – MISSION ITINERARY (FOR DECEMBER 4-11, 2011)

The evaluation mission was comprised of an international consultant Mr. Roland Wong in accordance with the objectives of the evaluation and obtained data relevant for making judgments regarding Project success and lessons learned.

<i>December 4, 2011 (Sunday)</i>			
#	Activity	Stakeholder involved	Place
	Arrival of Mr. Roland Wong		Male'
<i>December 5, 2011 (Monday)</i>			
1	Briefing on RETDAP with UNDP Maldives with Azusa Kubota (Programme and Operations Coordinator), Ms. Aminath Shooza (Programme Associate) and Mr. Mohammed Inaz (Assistant Resident Representative)	UNDP Maldives	Male'
2	Briefing from MHE on RETDAP with emphasis on Comp. 1 (Policy), Comp. 5 (Financial) and Comp. 6 (Pilot Projects)	MHE	Male'
<i>December 6, 2011 (Tuesday)</i>			
3	Continuation of briefing from Mr. Ahmed Ali and Mr. Zammath Khaleel, and MHE on RETDAP with emphasis on Comp.2 (Resource Assessment) and Comp 3 (Advocacy), Comp. 4 (Technical Capacity) and Comp. 6 (Pilot Projects)	MHE	Male'
4	Meeting with Ms. Hudha Ahmed of Renewable Energy Maldives	Renewable Energy Maldives	Male'
<i>December 7, 2011 (Wednesday)</i>			
5	Continuation of RETDAP briefing with Mr. Ali and Mr. Khaleel of MHE with emphasis on Comp. 6 (Pilot Projects)	MHE	Male'
6	Meeting with Deputy Director of MEA focused on Comp. 1 (Policy) and overall outcomes of the project as well as future directions	MEA	Male'

7	Meeting with STELCO on pilot projects and implementation of RE in the Maldives, future and current RE initiatives in the Maldives and building capacity needs	STELCO	Male'
December 8, 2011 (Thursday)			
8	Meeting with Board of FRESA including Mr. Mohamed Ahmed (Head of Development Banking Cell), Mr. Abdul Majeedh Ali (Junior Officer, Development Banking Cell), Mrs. Fathimath Manike (Assistant Managing Director of Bank of Maldives), Mr. Ahmed Ali (Assistant Director, Energy Engineering, Climate Change and Energy Department, MHE), Mr. Zammath Khaleel (Environmental Analyst, Climate Change and Energy Department, MHE), Mr. Ajwad Musthafa (Deputy Director, MEA), Ms. Aminath Nashia (Director, MFT)	FRESA Board (Bank of Maldives, MFT, MHE)	Male'
December 9, 2011 (Friday)			
	Preparation of the report		Male'
December 10, 2011 (Saturday)			
9	Field trip to Mandhoo Island to visit pilot solar project	MHE	Male'
December 11, 2011 (Sunday)			
10	De-briefing meeting with MHE	MHE	Male'
11	De-briefing meeting with UNDP Maldives	UNDP Maldives	Male'
	Departure of Roland Wong from Male'		

Total number of meetings conducted: **11**

APPENDIX C – LIST OF PERSONS INTERVIEWED AND DOCUMENTS REVIEWED

This is a listing of persons contacted in the Maldives (unless otherwise noted) during the Final Evaluation Period only. The Evaluator regrets any omissions to this list.

- 1) Ms. Azusa Kubota (Programme and Operations Coordinator)
- 2) Ms. Aminath Shooza (Programme Associate)
- 3) Mr. Mohammed Inaz (Assistant Resident Representative)
- 4) Mr. Ahmed Ali, Assistant Director, Energy Engineering, Climate Change and Energy Department, MHE)
- 5) Mr. Zammath Khaleel, Environmental Analyst, Climate Change and Energy Department, MHE
- 6) Mr. Mohamed Ahmed (Head of Development Banking Cell)
- 7) Mr. Abdul Majeedh Ali (Junior Officer, Development Banking Cell)
- 8) Mrs. Fathimath Manike (Assistant Managing Director of Bank of Maldives)
- 9) Mr. Ajwad Musthafa, Deputy Director, MEA
- 10) Ms. Aminath Nashia, Director, MFT
- 11) Ms. Hudha Ahmed, Director, Renewable Energy Maldives Pvt Ltd.
- 12) Mr. Ahmed Iqbal, Senior Engineer, STELCO
- 13) Mr. Ahmed Saif - Engineer, STELCO

Documents reviewed for this evaluation (all from UNDP unless otherwise noted) includes:

1. *RETDAP Project Implementation Reports*, UNDP (2006, 2007, 2008, 2009-10 and 2011);
2. *Minutes of Tripartite Review Meeting* (March 2007);
3. *UNDP Project Document of RETDAP*;
4. *Project Document of “Assistance to Maldives in Developing the Energy Sector through Energy Resource Assessment leading to Sustainable Energy Formulation”*, UNDP Thematic Trust Fund on Energy for Sustainable Development (Energy TTF);
5. *Maldives 2009 Carbon Audit*, BeCitizen November 2010;
6. *Project Concept Paper of “Maldives Low Emission Climate Resilient Development Programme”*, UNDP, August 2011;
7. *Mid-Term Review of Maldives: Renewable Energy Technology Development and Application Project (RETDAP)*, UNDP, September 2007;
8. *Seventh National Development Plan (2006-10)*, Government of Maldives (Ministry of Planning and National Development);
9. *National Energy Policy – Maldives*, Final draft (Aldover, 2006);
10. *National Energy Policy and Strategy*, Ministry of Housing and Environment, 2010;
11. *Maldives Energy Balances and Indicators 2003-2005*, Energy Consulting Network, August 2006;
12. *Energy Supply and Demand, Technical Report*, Energy Consulting Network, 2003;
13. *Report on Energy Supply and Demand 2008-2009*, Riyan, August 2010;
14. *Renewable Energy Tariff Structure (RETDAP)*, UNDP, May 2009;
15. *National Assessment Report 2010*, Department of Climate Change and Energy, MHTE;
16. *Wind Energy Resource Atlas of Sri Lanka and the Maldives*, by D. Elliott, M. Schwarz, G. Scott, S. Haymes, D. Heimillier and R. George, National Renewable Energy Laboratory (NREL, 2003). Available at www.rsvp.nrel.gov/wind_resources.html;
17. *Marine Energy in the Maldives: Pre-Feasibility Report on Scottish Support on Maldives Marine Energy Implementation*, Centre for Understanding Sustainable Practice, Robert Gordon University, Aberdeen, Scotland, July 2011;
18. *Renewable Energy Systems and Maintenance Course Syllabus*, Faculty of Engineering Technology, MCHE, July 2009;
19. *Evaluation of FRESA, (Fund for Renewable Energy System Applications)*, Æquilibrium Consulting GmbH, December 2011;

20. *Fund for Renewable Energy System Applications (FRESA), Financing Scheme, Financing Application Guidelines and Operational Plan*, RETDAP, UNDP-GEF, November 2006;
21. *Revolving Fund Concept: Financial Mechanism for Low Carbon Energy Sector (Draft)*, CCED – MHE, December 2011;
22. *Final Report: Landfill Gas*, Energy Consulting Network, Danish Technological Institute, Gas Con and Tech-Wise, December 2004;
23. *Technical Report – Biomass Survey*, Energy Consulting Network, Danish Technological Institute, Gas Con and Tech-Wise, April 2004;
24. *Technical Report – Design and Specifications of Pilot Hybrid System*, Energy Consulting Network, Danish Technological Institute, Gas Con and Tech-Wise, April 2004;
25. *Technical Report – Assessment of Least-Cost Sustainable Energy Resources, Maldives*, Energy Consulting Network, Danish Technological Institute, Gas Con and Tech-Wise, December 2004;
26. *Technical Report – Energy Supply and Demand*, Energy Consulting Network, Danish Technological Institute, Gas Con and Tech-Wise, April 2003;
27. *Solar PV/Diesel Hybrid System, Adh. Mandhoo*, MEEW, November 2006;
28. *Environmental and Social Due Diligence for Preparation of Renewable Energy and Energy Efficiency Investment Plan and Bidding for Thinadhoo Island*, KEMA Nederland, B.V., August 2011;
29. *The Implementation Potential of Renewable Energy Technologies in the Maldives*, K. van Alphen, Utrecht University, Maldives, 2004;
30. *Maldives Climate Change In-Depth Technology Needs Assessment – Energy Sector*, Commerce Development and Environment, 2007.

APPENDIX D – REQUIRED PROJECT IDENTIFICATION AND FINANCIAL DATA

I. Project Identification

GEF Project ID: 1029

GEF Agency Project ID: 2131

Countries: The Maldives

Project Title: Renewable Energy Technology Development and Application Project (RETDAP)

GEF Agency (or Agencies): UNDP

II. Dates

Milestone	Expected date	Actual date
CEO endorsement/approval		August 27, 2003
Agency approval date	March 18, 2004	March 18, 2004
Implementation start	March 18, 2004	March 18, 2004
Midterm evaluation	March 18, 2006	September 25, 2007
Project completion	March 18, 2008	December 31, 2011
Terminal evaluation completion	January 18, 2008	December 11, 2011
Project closing	March 18, 2008	March 31, 2012

III. Project Framework

Project component	Activity type ⁵²	GEF financing (in \$)		Co-financing (in \$)	
		Approved ⁵³	Actual	Promised	Actual
1. Development of RE policies, laws and regulations	TA	58,580	14,150	103,580	120,000
2. RE resources in the Maldives assessed	TA	20,360	12,084	230,080	319,000
3. Awareness of RE created and improved	TA	85,560	37,266	108,900	0
4. Understanding of RE technology improved	TA	121,650	116,207	18,570	0
5. Increase in RE finance and financial mechanisms	Inv	250,000	250,000	209,930	0
	TA	6,810	26,233	0	15,000
6. RE projects developed	TA	182,040	124,298	1,342,720	1,590,000
Project management	TA	0	144,762	0	316,000
PDF-A	TA	25,000	25,000	0	0
Total		750,000	750,000	2,013,780	2,360,000

⁵² Inv= Investment, TA= technical assistance

⁵³ Promised co financing refers to the amount indicated at the point of CEO endorsement/approval

IV. Co-Financing

Sources of Co-financing	Type	Project preparation		Project implementation		Total	
		Expected	Actual	Expected ⁵⁴	Actual	Expected	Actual
Host gov't contribution	In Kind	0	0	330,780	331,000	330,780	331,000
	Cash	0	0	1,314,000	1,180,000	1,314,000	1,180,000
GEF Agency (ies)	Cash	0	0	369,000	369,000	369,000	369,000
Bilateral aid agency (ies)	Cash	0	0	0	230,000	0	230,000
Multilateral agency (ies)	In Kind	0	0	0	100,000	0	100,000
	Cash	0	0	0	100,000	0	100,000
Private sector		0	0	0	50,000	0	50,000
NGO		0	0	0	0	0	0
Other		0	0	0	0	0	0
Total Co-financing		0	0	2,013,780	2,360,000	2,013,780	2,360,000

⁵⁴ Expected amounts are those submitted by the GEF Agencies in the original project appraisal document.

APPENDIX E – ORIGINAL MARCH 2003 PROJECT FRAMEWORK DESIGN

Renewable Energy Technology Development and Application Project (RETDAP) Project Framework Design

Objectives	Success Indicators	Means of Gauging Success	Critical Assumptions
Development Goal: The growth rate of GHG emissions from fossil fuel using activities, such as power generation and process/water heating, is reduced through the removal of the major barriers to the development and application of renewable energy (RE)-based systems that can supplant part of the fossil fuel use in the Maldives.	The annual growth rate of GHG emissions from fossil fuel-based electric power generation in the country is reduced by about 2% by the end of the project compared to when no interventions are implemented.	Documentation of annual GHG reductions based on data of annual power generation from installed and operational RE-based power systems.	Monitoring activities under the project on RE-based power generation and RE-based energy systems (non-electricity) are fully supported and implemented.
		Results of survey of energy consumption and energy savings from the operation of RE-based energy systems.	
Project Purpose: The potentials of available renewable energy (RE) resources in Maldives are assessed, developed and used cost-effectively for both electricity and non-electricity applications.	The annual growth in installed capacity of RE-based power generation systems in the country is about 2.1% by the end of the project.	Documentation of the annual inventory of RE-based power generation systems installed capacity from the NEO/MCST.	Compliance of RE-based power generation units and users to the reporting requirements of RETDAP to NEO/MCST is assured.
	The electricity demand in the OIAs served by RE-based power generation (stand alone and hybrid) increases by 2.6% per year after the project.	Records of electricity consumption in OIAs	Electricity consumption is metered.
	The annual growth in installed capacity of RE-based energy systems (non- electricity) in the country is about 10% by the end of the project.	Results of survey of energy consumption and energy savings from the operation of RE-based energy systems.	Monitoring activities under the project on RE-based energy systems (non-electricity) are fully supported and implemented.
Component No. 1: RE Advocacy and Awareness Enhancement			
Immediate Objective 1: Provision of adequate, affordable, accessible and up-to-date information services, continuing education, and awareness improvement on the application of RE resources.	A sustainable and continuously evolving program of providing RET information services, continuing education, and awareness enhancement, covering the energy applications of RE resources is established & implemented by 3rd yr.	RE Information Center in MCST, RE technology education program, Integrated RE information exchange service, and Information campaigns on RET in OIAs.	The relevant government institutions and target groups will be interested in participating and cooperating in the design, development and implementation of the activities under this project component.

1.1. Establishment of a RE Information Center in MCST	RE Information Center established at the MCST and functioning by yr1.	Documentation on the official inauguration of the RE Information Center.	Information demand regarding RE is significant.
	An average of about 100 guests are served by the RE Information Center each year starting yr1.	Guest book of the RE Information Center, and record of services provided.	Guest book and service logbook are maintained.
1.2. Design and conduct of a RE Technology Education Program	In-house RE technology training course for MCST staff started by yr1.	Documentation of the provision and completion of the RE technology training course.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.
	Study tour/fellowship program on RE system design and applications for selected relevant government and private sector personnel starting yr2.	Satisfactory report on the RE system design and applications study tour/fellowship program and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.
	Trained government personnel (particularly the MCST staff) are actively involved on RE development activities in the country starting yr2.	Time sheets or activity reports of personnel working on RE-based project development and implementation.	Project staff prepares time sheets and activity reports.
	About 50 % of the trained private sector personnel engaged in RE-based project development and implementation activities in the country starting yr3.	Documentation of RE-based energy system projects with specific mention of the project designers, developers and implementors, including RE system equipment suppliers and service providers.	Relevant regulations on the certification of RE service providers and system suppliers are enforced, including the declaration of project designers, developers and implementors in the permit applications.
	Comprehensive annual training course (1st quarter of each year) on RE technology for Outer Island and Atolls (OIA) Development personnel successfully conducted.	Documentation of the provision and completion of the RE technology training course.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.
	Comprehensive annual training course (1st quarter of each year) on the maintenance and operation of RE systems for OIA people successfully conducted.	Satisfactory report on RE system operation and maintenance training course and the documentation of the training course materials.	Target groups are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.

	At least 50% of the trained personnel in the OIAs are managing, operating and maintaining RE-based energy systems starting yr3.	Documentation of RE-based energy system projects with specific mention of the project designers, developers and implementors, including RE system equipment suppliers and service providers.	Relevant regulations on the certification of RE service providers and system suppliers are enforced, including the declaration of project designers, developers and implementors in the permit applications for RE project implementation and RE system operation.
1.3. Establishment and implementation of an Integrated RE Information Exchange Service	A fully functioning information exchange services program is operationalized by yr2.	Documentation of the program operation, services provided, and comments of clients.	There is a continuous demand for technical information on RE technology applications.
	Publication and circulation of a quarterly newsletter containing information gathered through the information exchange service (local/ regional) starting 4th quarter of yr1.	Published newsletters distributed to the target readers.	
	Around 10 RE-based energy projects or installations in the country monitored each year by MCST starting yr 2.	Documentation on the monitoring reports.	This will be a regular and continuous activity of the NEO/MCST.
	Profiles of monitored RE-based energy projects/installations in the country prepared and updated annually by MCST starting yr2.	Published articles and/or profiles of RE-based energy projects in the country.	This will be a regular and continuous activity of the NEO/MCST.
	Information materials on RE technology incorporated in the MCST database starting yr2.	Database compiling information on RE technology installed at RE Information Center.	Researchers, scientists, and manufacturers use database.
	Subscription of scientific journals on RE Technology is received regularly by the Information Center starting yr1.	Compilation of journals/publications on RE technology.	NEO/MCST will continue the subscriptions even after the RETDAP
	Abstracts/Information Notes on relevant articles on RE Technology are annually prepared by MCST, printed in the newsletter and incorporated in the NEO database starting yr3.	Compilation of abstracts and information notes. Newsletters and RE Information Center database.	RE Information center staff regularly, and are technically capable to, carry out abstracting of technical articles.

1.4. Conduct of Information Campaigns on RE Technology Applications in Outer Islands and Atolls (OIAs)	Printed information materials on RE technology promotion produced and disseminated quarterly starting yr2.	Disseminated RE technology information materials	This will be a regular and continuous activity of the NEO/MCST.
	Production of multi-media campaign materials on RE technology applications starting mid-yr1.	Documentation on the multi-media campaign materials preparation	This will also target the island resorts.
	Applicable RE technologies are demonstrated through one product exhibition at yr3 and four demonstration schemes during the duration of the project.	Documentation on the product exhibitions and the demonstration schemes.	Island resorts are also interested in implementing RE-based energy system projects on their own.
	An annual average of 100 RE-based energy project are proposed by the IDCs and individuals starting yr3.	Documentation of the project proposals	Interest of IDCs in RE-based energy projects influenced by the information campaigns.
	An annual average of 20 replication projects are developed and implemented in country starting mid yr4.	Documentation of the replication projects	Regular monitoring of RE-based energy projects are carried out (see Activity 1.3)
1.5. Introduction of a "one-stop-shop" service for RE market services	RE "one-stop-shop" service is established in NEO to cater to the provision of RE market services by yr3.	RE "one-stop-shop" within the NEO providing RE market services.	
	RE "one-stop-shop" services provided to an average of about 40 clients each year starting yr3.	Documentation of services provided by the "one-stop-shop" and guest logbook.	
Component No. 2: RE Resource Assessment			
Immediate Objective 2: Establishment of the availability and appropriate uses of RE resources in the country.	A comprehensive assessment and database of RE resources in the country completed by end of yr2 and utilized by the government and private sector for RE research, energy policy development and planning and RE project investments by end of project.	RE resource survey, Assessment of technical requirements of RET applications, RE resource assessment methodology, RE resource database, RE monitoring and simulation methodology, and capacity building program for RE resource assessment	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.

2.1. Conduct of RE resource survey	RE resource (wind, solar, biomass, landfill gas, etc.) surveys in selected areas in the country where the RE resource potentials are significant completed by mid yr2.	Documentation of the surveys conducted and the survey results.	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.
2.1.1. Conduct of detailed assessments of the technical requirements of wind/solar technology applications in potential areas.	Comprehensive assessment results on the technical requirements wind/solar technology applications (e.g., wind velocities and solar radiation intensities) compiled and analyzed by end of yr2.	Documentation of the assessment conducted and the assessment results.	RE resource assessment activities in the country that are carried out by NREL and UNDP are included in the project.
2.1.2. Conduct of detailed assessments of the technical requirements of other relevant RE technology applications.	Comprehensive assessment results on the technical requirements of other relevant RE technology applications compiled and analyzed by end of yr2.	Documentation of the assessment conducted and the assessment results.	Other RE resource assessment activities to be covered by funding leveraged by NREL (e.g., USAID).
2.2. Development of a RE Resource Assessment Methodology	A suitable methodology for RE resource assessment agreed by Q2 of yr1.	First edition of the guidebook on the use of the methodology.	RE specialists in the country and in the region will participate in this activity.
	Methodology for RE resource assessment is used and improved each year.	Yearly updates of the methodology as printed in the guidebook.	This will be a regular and continuous activity of the MCST.
2.3. Design and development of a RE resource database	Comprehensive RE resource database covering selected island/atoll groups developed by end of yr2, and subsequently maintained by MCST.	Database installed at the RE Information Center in NEO/MCST.	Adequate and up-to-date database equipment are available.
	RE resource database is updated by MCST annually.	Yearly updates of the database	This will be a regular and continuous activity of the MCST. Inputs will come from results of RE resource assessments, which will continue after the RETDAP.
2.4. Development of a RE monitoring and simulation methodology	Suitable methodology for monitoring and simulation of wind energy resource completed by Q2 of yr3.	Guidebook on the wind energy resource monitoring and simulation methodology.	World-renowned RE Experts will contribute to this activity.
	Suitable methodology for monitoring and simulation of solar energy resource completed by Q2 of yr3	Guidebook on the solar energy resource monitoring and simulation methodology.	

	Suitable methodology for monitoring and simulation of other relevant energy resources completed by Q3 of yr3.	Guidebook on the other RE resource monitoring and simulation methodology.	
	Results derived from RE monitoring and simulations are used in energy planning and policy making starting yr3.	Documentation of energy forecasts based on monitoring results and simulation runs	Energy planners are aware and knowledgeable in the use of the monitoring results and simulation runs in energy planning and policy making.
2.5. Conduct of capacity building program on RE resource assessment for relevant government agencies	In-house training for relevant government agencies (e.g., MCST, DMet) on RE resource data gathering, interpretations and analysis completed by yr1.	Satisfactory report on the in-house training and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.
	In-house training for relevant government agencies (e.g., MCST, DMet) on RE monitoring and simulation completed by end of yr3.	Satisfactory report on the in-house training and the documentation of the training course materials.	Relevant personnel are interested and willing in participating in the training and in applying the knowledge/knowhow they learn.
	About 30% of the trained personnel of RE resource assessments/monitoring and evaluation are providing training to other relevant MCST, DMet, OIA personnel each year starting yr3.	Documentation of training courses conducted and/or facilitated by personnel who have undergone training on RE resource assessments/monitoring and evaluation.	Training course is conducted regularly even after the RETDAP.
Component No. 3: RE Policy Development And Institutional Strengthening			
Immediate Objective 3: Strengthening and improvement of the policy and regulatory framework to encourage feasible RE-based energy projects.	Government policy and accompanying implementing rules and regulations on the utilization of feasible RE resources for electricity and non-electricity projects is established by end of yr2.	National Energy Office (NEO), National energy policy incorporating RE development and utilization, RE promotion workshops, RE-based OIA electrification study, RE electricity pricing study, RE-based livelihood and productivity projects support policy study, energy balance in Maldives, integrated national energy planning, national energy policy implementation, and "one-stop shop" services.	The GoM will implement all activities relevant to RE development and geared towards the achievement of RE objectives.
3.1. Strengthening of the newly established national energy office (NEO) that will be responsible for all energy matters.	Adequately staffed with trained personnel in National Energy Office (NEO) by Q4 of yr2.	Fully functional NEO	All trained personnel for NEO staff positions will assume their job functions.

3.2. Formulation and implementation of a national energy policy incorporating RE development, utilization and pricing	A clear government policy on the promotion, development and utilization of RE both for electricity and non-electricity applications is established and enforced by yr3.	Documentation of the policy statement and supporting policies and regulations from the NEO.	
	Policy study concerning the provision of incentives (e.g., financial, fiscal) to prospective RE project developers completed by end of yr2.	Documentation of appropriate incentive policy recommendations.	
	Study on RE-based OIA electrification completed by end of yr2.	Documentation of the study	GoM policy will focus on bigger role of NRE in OIA electrification.
	RE-based OIA electrification policies including policy support activities and guidelines recommended to government by end of yr2.	Documentation of the proposed policies, policy support activities and implementation guidelines.	
	Study on RE electricity pricing completed by mid yr3.	Documentation of the study	
	Proposed policy and regulations on the production and sales of RE electricity recommended to, and considered by, the government by yr4.	Documentation of the proposed policies and implementing rules and regulations.	
	NEO personnel are doing energy policy formulation and review starting yr2.	Proposed energy policies formulated by NEO personnel.	
	NEO start formulation and recommendation of energy policies & framework starting mid-yr2.	Proposed energy policies formulated by NEO personnel.	
3.3. Conduct of RE promotion workshops focusing on the relevant policies, policy instruments and policy support activities	National workshops on RE promotion and RE utilization for electricity and non-electricity applications conducted semi-annually until last year of project implementation.	Documentation of workshop proceedings	
	About 10 local groups in the OIAs propose policies and policy support activities on RE applications each year starting yr1.	Documentation of proposals of OIAs submitted to NEO.	

3.4. Conduct of a study on RE-based Livelihood and Productivity Projects Support Policy	Study of potential livelihood support and productivity projects that will utilize electricity from RE systems (stand-alone or hybrid) completed by yr1.	Documentation of the study	There are interested private entrepreneurs within the OIAs in investing livelihood and small/medium scale industrial activities.
	A total of 20 potential livelihood support and productivity projects are proposed and evaluated each year starting yr3.	Documentation of the proposals and applications for livelihood support and productive use projects/activities.	
3.5. Conduct of a detailed study on energy supply and consumption in Maldives	An initial detailed evaluation report on the energy supply and end-use consumption in Maldives, including energy demand and energy trends/profiles completed by yr2 and reviewed annually.	Evaluation report on national energy supply and end-use consumption	
	The national energy office (NEO) updates and reports on the energy balance of the country annually starting yr3.	Documentation of annual national energy balance.	
3.6. Conduct of an Integrated National Energy Planning	NEO personnel are capable of conducting least-cost integrated energy planning by yr2.	Energy planning reports prepared with significant contribution/inputs by NEO personnel.	
	Planners from relevant government agencies are capable of doing energy-integrated planning by yr2.	Energy planning reports prepared with significant contribution/inputs by NEO personnel.	
	The Initial National Energy Plan of Maldives is prepared and completed by yr2.	Documentation of the National Energy Plan	
3.7. Evaluation of the National Energy Policy Implementation	Annual growth of fossil based energy consumption is reduced by 2.2% by the end of the project.	Documentation of annual national energy balance.	
	Annual production of RE electricity is increased by 2.1% by end of project.	Documentation of the annual production and sales of RE electricity.	
3.8. Conduct of a review of the RE Policy	Revised policy and implementing guidelines covering pricing, incentives, etc. issued and enforced by yr4.	Documentation of the revised policy and implementing guidelines.	All RET demo projects are implemented, monitored and evaluated.

Component No. 4: RE Technical Capacity Building			
Immediate Objective 4a: Establishment of the potentials and requirements for the energy applications of RE resources, as well as the support provisions for such initiatives.	Assessment of the needs and potentials for applications of RE resources are completed and provisions for support are in place by end yr3.	Assessment of other value-added RE resource applications, study on a local RE consultancy service industry, assessment of local RE equipment and components manufacturing capabilities, training courses on the design, feasibility analysis, operation and maintenance of RE-based energy systems, sustainable RE system R&D program, and plans for RE-based power generation projects in OIAs. Capacity building for future RE manufacturing industry.	The NEO/MCST and local engineering firms are interested in developing the local RE engineering and consultancy industry, including the manufacture of RE system equipment and components for domestic consumption or even for the export market.
Immediate Objective 4b: Continuous promotion and support of the development and application of RE resources for outer islands (electricity and non-electricity applications) supporting socio-development in OIAs.	The RE-based energy system owners, and private entrepreneurs in OIAs commit 10% of their gross revenues each year for supporting RE technology development starting yr 3. The GoM commits a percentage of its annual gross revenues for promotion and support of RE starting yr3.		
4.1. Assessment of Other Value-added Applications of RE Resources	Assessment of other value-added applications of RE resources completed by end of yr2.	Documentation of the various assessments conducted.	Private sector and the IDCs are interested in other alternative uses of RE resources, either for energy or non-energy purposes.
	Recommendations on the development and implementation of other value-added applications of RE resources promoted & disseminated by end of yr2.	Assessment report	
4.2. Evaluation of the viability and the requirements for the development of a local RE Consultancy Service Industry	Assessment of the viability of a local RE consultancy service industry completed by yr3.	Assessment report	
	A total of approx. 5 entities expressed interests and initiated plans to provide RE consultancy services by end of the project.	Documentation of investment proposals to relevant government agency.	
4.3. Assessment of Local Capabilities for the Provision of RE Services	Evaluation report on the capabilities of local engineering and consulting services in the area of RE completed by mid yr4.	Evaluation report on local RE engineering and consultancy services	Cooperation of existing (if any) RE system maintenance service providers is ensured.

4.4. Assessment of the Viability of Local Manufacturing of RE System Equipment and/or Components	Assessment of the viability of local manufacturing of RE system equipment and/or components completed by end of yr3	Evaluation report on local RE system and system component manufacturing	Private sector is interested in investing in the manufacturing of RE system equipment and/or components.
	Investors from within and outside the country used the study findings for possible investments in RE equipment manufacturing in the country by end of the project.	Documentation of investment proposals to relevant government agency.	
4.5. Design and conduct of Training Course on the Design, Feasibility Evaluation, Operation and Maintenance of RE Systems for potential local engineering consultants and RE system suppliers.	Comprehensive training course on the design, feasibility evaluation, maintenance and operation of RE systems for local engineering consultants completed by end of yr4.	Documentation of training course materials as well as the individual training course evaluation reports (highlighting results, trainee comments and recommendations) submitted to NEO/MCST	Training course designed for subsequent certification of local engineering companies and consultants by the NEO/MCST.
4.6. Design and initiation of a Sustainable RE System R&D Program	Sustainable RE system (wind, solar, biomass) R&D program designed by mid yr4.	Documentation of the proposed sustainable RE system R&D program	
	Sustainable RE system R&D program approved and initiated by the GoM by end of the project.	Documentation of the proposed R&D program	
4.7. Formulation of Plans for RE-based Power Generation Projects in OIAs.	Proposals for RE-based power system projects completed by end of project.	Documentation of project proposals at the NEO/MCST.	RE development is continuously and fully supported by the GoM for socio-economic development.
	Feasible RE-based power system projects proposals presented to GoM, donors and private investors by yr4 Q2.	Documentation of the presentation materials at NEO/MCST.	
Component No. 5: RE Project Financing Schemes			

Immediate Objective 5: Encouragement of the government and private sectors to provide financial assistance to the development and implementation of RE-based energy projects, as well as livelihood and productive use initiatives that will utilize energy from RE-based projects.	Financing assistance program for RE-based energy projects, as well as RE-supported livelihood and productive use projects are established and availed of by project developers and island communities by end of yr3	Training on RE projects and RE-based livelihood/productivity projects financing, established FRESA in OIAs, FRESA financing schemes and eligibility criteria, assistance services for FRESA financing applicants, and evaluation report on FRESA project financing assistance program.	The GoM and the private sectors will be interested in investing in RE-based energy projects as well as livelihood support and productive use projects in the OIAs. Contingent upon the passing of the cooperative law in the Parliament.
5.1. Design and conduct of a Training Course on RE Projects and RE-based Livelihood/Productivity Projects Financing	A total of 3, one for each group, training courses conducted for: (1) private and government financial institutions; (2) commercial banks; and, (3) private entrepreneurs, by end Q2 of yr3.	Satisfactory report on the in-house training and the documentation of the training course materials.	GoM and the private sector will be interested in providing financing for rural livelihood and industry projects, including RE-based power generation.
	RE-based projects and productivity projects are being considered for financing by private and government financial institutions; commercial banks; and, private entrepreneurs starting yr4.	Documentation of processed/evaluated applications for financing support for RE-based energy and productive use projects.	
5.2. Design and establishment of a Fund for RE System Applications (FRESA) in OIAs	FRESA established by the GoM by mid-yr3.	Documentation of the official establishment of the FRESA	A financial institution is assigned as fund manager of the FRESA.
5.3. Design and development of FRESA Financing Schemes	Clear and well-defined mechanics of the FRESA financing scheme, including the financing eligibility criteria, available and enforced by mid yr3.	Documentation of the RE Fund including the financing mechanics, rules and regulations, eligibility criteria, etc.	IDCs are eligible to receive loans from FRESA and such is fully supported by the GoM.
	Legal status of IDCs (if necessary) for availing of financing from FRESA is established and secured by the end of yr2.	Documentation of the legal status of IDCs for availing of FRESA financing.	
5.4. Provision of Assistance Services to FRESA Financing Applicants	RE "One Stop Shop" in the NEO processing an average of 40 applications per year starting mid-yr3.	Documentation of the "One Stop Shop" service including the description of the services provided, procedures, recommendations, etc.	MCST will contribute to the operation of the "One Stop Shop".

	Approved FRESA financial assistance applications based on the financing assistance package by NEO/MCST starting mid-yr3.	Documentations of the approved financial assistance packages.	Livelihood support and productive use projects will utilize electrically operated equipment, appliances, or machineries, and or process heating devices.
5.5. Evaluation of the FRESA Project Financing Assistance Program	An average total of 20 approved financial assistance applications based on the FRESA assistance package per year starting yr3.	Documentation of approved project financing applications.	
	Favorable economic and financial performance of RE supported livelihood/productive use projects, whereby target payback periods of 50% of the projects are achieved by end of project (yr4).	Documentation of financial reports of the supported projects submitted to the fund manager.	
Component No. 6: RE System Project Development			
Immediate Objective 6a: Demonstration of the techno-economic viability, design, development, financing and sustainable operation & maintenance of RE-based energy projects.	a. Techno-economic feasibility of RE-based energy projects in selected demo sites, including the necessary implementation requirements from the MCST, financing institutions and the national power utility established by yr3.	Techno-economic feasibility analyses of potential RE-based systems in OIAs, RET demo requirements evaluation, RE delivery mechanisms for demo schemes, activities for removing barriers to demo scheme implementations, baseline data for demo sites, FRESA implementation program, promotional campaigns for RE delivery mechanism demonstrations, design of RE system for demo sites, RE demonstration projects implementation, M&E of demonstration sites, revised RE policy, and published demonstration program results.	Co-financing is ensured for the implementation of identified demo RE projects, and that the private sector and/or the IDCs will be interested in operating and maintaining these facilities.
Immediate Objective 6b: Facilitation of the effective demonstration of the techno-economic viability, design, development, financing and sustainable operation & maintenance of livelihood and productive use initiatives supported by RE-based energy projects.	b. Rural-based small to medium scale enterprises (SMEs) are operating profitably utilizing the energy from RE-based project by yr4.		
6.1. Conduct of Techno-economic Feasibility Analyses of Potential RE-based Systems in OIAs	Report on the techno-economic feasibility analyses of potential RE-based energy systems in OIAs completed by yr3.	Techno-economic feasibility reports for each potential RE-based energy system projects.	
	An average total of 4 feasible RE-based energy systems in OIAs each year.	Project profiles of technically and economically feasible projects	

6.2. Finalization of the demo sites, identification and evaluation of RET Application Demo Requirements	Final list of demonstration sites approved by Q3 yr2.	Documentation of the final list of demonstration sites.	
	Report on the feasibility and implementation requirements for the demonstration schemes completed by end of yr2.	Documentation of the techno-economic feasibility of the specific demonstration projects.	
6.3. Identification and implementation (in conjunction with Item 6.2) of courses of actions for the removal of barriers to the successful implementation of RE technology application demonstration schemes.	Barriers to, and other necessary requirements for, the implementation of the demonstration schemes are eliminated/mitigated by the end of yr3.	Documentation of specific studies and actions taken to address the potential barriers to the implementation of the demonstration projects.	
	o Verified and confirmed availability and magnitudes of RE resource potentials in the selected demonstration sites completed by the end of yr2.	Documentation of verified availability and magnitudes of RE resource at site that will be used for the RE technology demonstration	Review of techno-economic feasibility analyses will include verification of technical and physical characteristics of the demo sites.
	o Financing assistance mechanism for financing of RE supported livelihood/productive use projects in the demo sites is set-up and implemented by Q1 yr3.	Documentation of the financial assistance arrangement with the selected financial institution (i.e., fund manager).	Fund manager is already assigned. And One-Stop shop is already operational.
6.4. Establishment of Baseline Data for the RE Technology Application Demonstration Sites	Electricity consumption and demand surveys at the demonstration sites and baseline performance data established by the Q2 yr2.	Electricity use and demand survey reports submitted to the NEO/MCST present electricity consumption of local residents as well as the expected demand of the planned livelihood support and productive use projects that will be set up in the area.	
	Operating performance targets for the planned RE systems are defined by Q2 yr2.	Documentation of agreed performance targets and the procedures for monitoring and evaluating the actual operating performance.	
6.5. Finalization of the design of the RE system that will be implemented in the demonstration schemes.	RE system basic engineering design for each demo site completed by Q3 yr2.	Documentations of the approved basic engineering designs.	

	Comprehensive technical and economic feasibility evaluations of demo RE systems completed by end of yr2.	Documentations of the completed and reviewed technical and economic feasibility reports.	
	Detailed engineering designs of each demo RE systems completed and approved by Q2 of yr3.	Documentations of the approved detailed engineering designs and equipment specifications.	
6.6. Implementation of RE demonstration projects	Equipment procurement and delivery at each site completed well within project time line.	Documentations of the equipment supply proposals, approved bids, procurement, shipment, delivery and acceptance, and physical equipment at demo sites.	To be implemented by the NEO/MCST (if no private sector involvement) or by the private developer (i.e., its own engineering staff or hired consultants/contractors).
	Civil engineering, electro-mechanical equipment and support facilities construction completed well within project time line.	Documentations of the civil engineering, electro-mechanical designs and support facilities. Actual inspection and inspection report of erected facilities.	
	Installation and commissioning of each demo RE system completed well within project time line.	Actual inspection and inspection reports, as well as the commissioning reports.	
	Demo site owners are satisfied with the technical assistance provided during start-up of the facilities.	Documentation of technical services provided during start-up and initial operations of facilities.	
6.7. Monitoring and Evaluation of the performance of each demonstration scheme	An evaluation report for each demo RE system highlighting the operating and economic performances completed midway of project implementation.	Documentation of each technical and economic performance evaluation report submitted to DoE.	
	RE-based energy system project implementors are reporting bi-annually the energy and GHG reduction impacts of their respective projects.	Bi-annual reports submitted by RE-based energy system project implementors submitted to NEO/MCST.	
	Survey of energy savings from RE-based system (non-electricity) projects conducted annually starting yr4.	Survey reports including the survey evaluation report.	
6.8. Evaluation and dissemination of the results of the Demonstration Program	A national workshop presenting the results of the demonstration program completed by yr4.	Proceedings of the workshop highlighting the papers presented, issues discussed, and recommendations.	

	Documented comments about the operation of the demonstration program by end of project.	Documentation of each technical and economic performance evaluation report submitted to NEO/MCST.	
	Increased installed capacity of RE-based power systems in the country bringing up the total to 100 kW by end of project.	Documentation of installed RE-based power systems in the country at NEO/MCST	
6.9. Design of sustainable follow-up program for RE development	Financing scheme is in place for supporting a follow up program for RE technology applications by end of yr4.	Documentation of the proposed financing scheme for the follow up program on RE technology applications.	Sufficient RE resources exist for large-scale development of RE energy applications.