BIOENERGY FOR SUSTAINABLE RURAL DEVELOPMENT

TERMINAL EVALUATION REPORT

Prepared by

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Table of Contents

List of Tables and Displays

Acronyms and Abbreviations

ABPP	Africa Biogas Partnership Programme
ACP	Advisory Committee on Procurement
AES	Agricultural Extension Service
APR	Annual Project Report
ARC	Agricultural Research Center
BSRD	Bioenergy for Sustainable Rural Development
BBL/D	Barrel per Day
BCM	Billion Cubic Metres
BDF	Bioenergy Development Fund
BET	Bioenergy Technologies
BSP	Bioenergy Service Provider
BSDA	Bioenergy Association for Sustainable Development
CBO	Community-based Organisation
CEO	Chief Executive Officer
CDM	Clean Development Mechanism
CDR	Combined Delivery Report
CO	Country Office
CPD	Country Programme Document
DANIDA	Term used for Denmark's development cooperation
DO	Development Objective
EEAA	Egyptian Environmental Affairs Agency
EOS	Egyptian Organization for Standardization
FiT	Feed-in-Tariff
FY	Fiscal Year
GEF	Global Environment Facility
GERD	Grand Ethiopian Renaissance Dam
GHG	Greenhouse Gas
GoE	Government of Egypt
GWP	Global Warming Potential
ILO	International Labour Organization
IP	Implementation Progress
IW	Inception Workshop
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
MISR	The romanized Arabic name of Egypt
MoALR	Ministry of Agriculture and Land Reclamation
MoU	Memorandum of Understanding
MSMEDA	Micro, Small and Medium Enterprises Development Agency
MTOE	Million Tons of Oil Equivalent

MTR	Mid-Term Review
NGO	Non-governmental Organization
NIM	National Implementing Modality
NREA	New and Renewable Energy Authority
NTC	National Technical Committee
OFRM	Office of Financial Resources Management
ORDEV	Organization for the Reconstruction and Development of the Egyptian Village
PBP	Performance-Based Payment
PIR	Project Implementation Review
PMU	Project Management Unit
POPP	Programme and Operations Policies and Procedures
PSC	Project Steering Committee
PTA	Principal Technical Advisor
REA	Rural Electrification Authority
RIEEP	Rural Income and Economic Enhancement Project
RTA	Regional Technical Advisor
SDG	Sustainable Development Goal
SFD	Social Fund for Development
SGP	Small Grants Programme
TCBC	Training Centre for Building and Construction
TE	Terminal Evaluation
TERI	The Energy and Resources Institute
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

Glossary of Evaluation-related Terms

Term	Definition
Baseline data	Data that describe the situation to be addressed by an intervention and serve as the starting point for measuring the performance of the intervention
Beneficiaries	The specific individuals or organizations for whose benefit an intervention is undertaken
Capacity development	The process by which individuals, organizations, institutions and societies develop their abilities individually and collectively to perform functions, solve problems and set and achieve objectives
Conclusion	A reasoned judgement based on a synthesis of empirical findings or factual statements corresponding to a specific circumstance
Effect	Intended or unintended change due directly or indirectly to an intervention
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results
Finding	A factual statement about the programme or project based on empirical evidence gathered through monitoring and evaluation activities
Impact	Positive and negative, intended and non-intended, directly and indirectly, long term effects produced by a development intervention
Indicator	Quantitative or qualitative factors that provide a means to measure the changes caused by an intervention
Lessons learned	Generalizations based on evaluation experiences that abstract from the specific circumstances to broader situations
Logframe (logical framework approach)	Management tool used to facilitate the planning, implementation and evaluation of an intervention. It involves identifying strategic elements (activities, outputs, outcome, impact) and their causal relationships, indicators, and assumptions that may affect success or failure. Based on RBM (results-based management) principles
Outcome	The likely or achieved (short-term and/or medium-term) effects of an intervention's outputs
Output	The product, capital goods and/or service which results from an intervention; may also include a change resulting from the intervention which is relevant to the achievement of an outcome
Rating	An instrument for forming and validating a judgement on the relevance, performance and success of a programme or project through the use of a scale with numeric, alphabetic and/or descriptive codes
Recommendation	A proposal for action to be taken in a specific circumstance, including the parties responsible for that action
Relevance	The extent to which the objectives of an intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donor's policies
Risk	Factor, normally outside the scope of an intervention, which may affect the achievement of an intervention's objectives
Sustainability	The continuation of benefits from an intervention, after the development assistance has been completed
Stakeholders	The specific individuals or organizations that have a role and interest in the objectives and implementation of a programme or project
Theory of Change	A set of assumptions, risks and external factors that describes how and why an intervention is intended to work.

Acknowledgement

The Evaluator would like to extend his appreciation to all project stakeholders whom he interviewed during the data collection phase. Due to international travel restrictions, the evaluation had to be conducted remotely through telecommuting platforms instead of meeting the key project informants in person. The Evaluator would like to render particular thanks to the project stakeholders and beneficiaries for their valuable insights and candid opinions on the project results and impacts that have significantly contributed to smooth conduct and effective completion of this evaluation.

Word of thanks is also extended to the staff of the UNDP Country Office in Cairo and the representatives of the UNDP oversight function for sharing all relevant documentation on the project and for availing themselves for discussion of some key findings and issues of the evaluation. The cooperation of the project team and all project partners was very effective and efficient and provided the Evaluator with all information needed.

EXECUTIVE SUMMARY

Project Information Table

Project Title	Bioenergy for Sustainable Rural Development		
UNDP Project ID (PIMS #):	2284	**PIF Approval Date:**	02 August 2006
GEF Project ID (PMIS #):	1335	**CEO Endorsement Date:**	14 July 2008
ATLAS Business Unit, Award # Proj. ID:		**Project Document (ProDoc) Signature Date (date project began):**	19 November 2008
Country(ies):	Egypt	**Date project manager hired:**	April 2010
Region:	RBAS	**Inception Workshop date:**	October 2010
Focal Area:	GEF-3 Climate Change	**Midterm Review completion date:**	February 2013
GEF Focal Area Strategic Objective:	Removal of barriers to commercial use of RE7	**Planned closing date:**	December 2013
Trust Fund [indicate GEF TF, LDCF, SCCF, NPIF]:	GEF TF	**If revised, proposed op. closing date:**	June 2019
Executing Agency /Implementing Partner:	Egypt Environmental Affairs Agency		
Other execution partners:	N.A.		

Project Financing	***at CEO endorsement (US$)***	***At Terminal Evaluation (US$)***
GEF financing:	3,000,000	1,779,848.60
In-kind contribution	0	0
UNDP	150,000	206,234.41 0
Government	1,760,000	1,693,586.74
Private Sector	250,000	0
Total co-financing	2,160,000	1,899,821.15
PROJECT TOTAL COSTS	5,160,000	4,916,795.78

Project Description

The project aimed at opening up a market for the development and dissemination of bioenergy technologies in Egypt to promote sustainable rural development and to reduce GHG emissions.

The goal of the project was to facilitate and accelerate the market development for new bioenergy technologies (BET) in Egypt, thereby promoting the sustainable socio-economic development of the rural communities in Egypt and reducing the negative global and local environmental impacts associated with the use of fossil fuels and the environmentally not sound management of the agricultural waste.

The objective of the project was to remove the technical, institutional, information, financial, and market barriers to developing the BET market in Egypt by (i) testing the feasibility and building the public confidence on BET systems and on the new business and financing models to facilitate their broader adoption, and on the basis of those models showing success, developing further the financial, institutional and market strategies for their large-scale replication; (ii) supporting the development and adoption of an enabling policy framework to implement and leverage financing for the recommended strategies; iii) building the capacity of the market supply side for marketing, finance and delivery of rural bioenergy services; and iv) institutionalizing the support provided by the project to facilitate sustainable growth of the market after the end of the project.

Summary of project results

Under the support from the project, total 1,1062 household and 118 community biogas units as well as 2 farm-level biogas digesters were installed in rural areas of 18 Governorates of Egypt. These numbers show that the project exceeded the planned installation targets. The biodigester units had been installed using the project funds as partial subsidies with variable cost-sharing (mostly in-kind) by the end users.

The post-installation monitoring showed more than 90% client satisfaction in 1-2 years after commissioning of the biodigester units and proved that the project has successfully demonstrated the use of the fixed dome biodigester units in Egypt. The successful installations initially stimulated the demand side of the emerging biodigester market. Recently conducted evaluation surveys found many installed units non-functional after a longer time interval from the installation. The recent findings suggest that the successful technology demonstration was not translated into the sustained technology use.

The Project Document highlighted the need for enabling policy to ensure a level playing field for bioenergy technologies and highlighted the establishment and adoption of such policy framework one of the key project targets. The project induced a limited policy support in the form of the Decree by the Board of Governorates that called for adoption of the biogas technology beyond the originally proposed 4-5 Governorates.

The project was involved in discussions on formulation of a specific feed-in-tariff for biogas that was proclaimed in 2019. The FiT together with gradual reduction of the fuel subsidies implemented since 2014 were important steps in the development of the country's significant potential for biogas use, while pursuing equally important economic, environmental and social policy objectives. However, there was no action at the national level towards establishment of

a systematic policy framework and provision of financial incentives in favour of bioenergy technologies.

For the supply side of the biogas market, the project established a relatively small pool of trained masons and engineers and facilitated their official registration as local microenterprises for provision of technical assistance and service for construction, commissioning and post-installation maintenance of biodigester units. The capacity building component had a visible gender impact as few of the female engineers trained by the project successfully launched start-up companies and have been providing services related to biogas installations.

However, lack of upscaling after the technology demonstration proved that the pure capacitation of the microenterprises was not sufficient for establishment of a robust and sustainable supply side of the biogas market as the capacity building efforts were not complemented by a suitable financial mechanism that would enable the microenterprises to operate in the early stage of biogas market creation. The lack of upscaling is also a reason that the project did not produce the expected global environmental benefits in terms of the GHG emission reduction.

The project catalysed establishment of the Bioenergy Association for Rural Development that took over from the Project Management Unit and will oversee further development of the bioenergy sector in Egypt. Through partnerships with universities in two Governorates, the project stimulated elaboration of special courses on bioenergy technologies and their inclusion in higher education curricula. This collaboration also initiated the work on preparation of quality standards for the biogas technology. The cooperation with academic sector catalysed development of a biogas laboratory for advancing the research work on utilization of bio-fertilizer from the biodigester operation in crops cultivation.

The project did not succeed to establish and demonstrate a functional financial support mechanism that would help to remove the financial barrier to post-project uptake of the household biodigester units and their upscaling.

Sustainability and progress to impact

The principal element important for the institutional sustainability of the project results has been the establishment of the Bioenergy Association for Sustainable Development The main risk to the institutional sustainability is the continued lack of supportive policies and regulatory frameworks for development of the biogas market, including development of standards for the design and construction of biodigester units and biogas systems' operation guidelines.

There are no major risks to socio-economic sustainability of results due to the positive health effects of using biogas systems from reduction of exposure to indoor and outdoor air pollution and better hygiene and sanitation from the cleanliness of biogas use in the kitchen. No major risks were noted to environmental sustainability due to the direct positive environmental impacts that include decreased demand for non-renewable fuels (wood or LPG), alleviation of methane emissions from livestock manure management, and limitation of synthetic fertilizer.

The financial sustainability depends on affordability of biodigester purchase and availability of adequate financial resources to rural households. Lack of end-user subsidies and absence of

micro-credits both for farmers and service providers poses a serious risk to financial sustainability of the project results, particularly due to the fact, that the project failed to demonstrate viable mechanisms for removal of financial barriers to developing the BET market.

The household level impacts of the project include savings of firewood and related reduction of time and workload for women and children for firewood collection, although the time savings are not absolute as some time has to be spent on collection of manure feedstock and water for biodigester operation. Additional impact at the household level is production of bio-slurry.

On top of the economic benefits to rural households, the biogas projects provide opportunities for direct employment of engineers and masons in the private sector service companies. The extent of real impacts produced by the project remains questionable as no real data on substitution of firewood, use of bio-slurry and jobs creation had been collected under the project.

Summary of evaluation ratings

The summary of evaluation ratings[1] according to the required evaluation criteria is displayed below.

Evaluation Criteria	Rating
Monitoring and evaluation: design at entry	Satisfactory (S)
Monitoring and evaluation: implementation	Moderately Satisfactory (MS)
Overall quality of monitoring and evaluation	**Moderately Satisfactory (MS)**
Quality of UNDP Implementation	Satisfactory (S)
Quality of Execution - Executing Agency	Satisfactory (S)
Overall quality implementation / execution	**Satisfactory (S)**
Relevance	**Relevant (R)**
Effectiveness	**Moderately Satisfactory (MS)**
Outcome 1	Satisfactory (S)
Outcome 2	Moderately Unsatisfactory (MU)
Outcome 3	Satisfactory (S)
Outcome 4	Moderately Satisfactory (MS)
Efficiency	**Moderately Satisfactory (MS)**
Overall Project Objective rating	**Moderately Satisfactory (S)**
Overall likelihood of sustainability	**Moderately Likely (ML)**
Institutional framework and governance	Moderately Likely (ML)
Financial	Moderately Likely (ML)
Socio-political	Likely (L)
Environmental	Likely (L)
Technological[2]	Likely (L)

Summary of recommendations

The Terminal Evaluation makes three sets of recommendations. The first set of recommendations is provided for immediate follow-up and/or reinforcement of the achieved results of the project. These recommendations are suggested for implementation as soon as

[1] Performance ratings of GEF projects are given in Annex 7.
[2] Rating of technological sustainability is optional, provided upon request of the Implementing Agency

possible using the existing institutional capacities and frameworks that had been created by the current project. The second set of recommendations addresses programmatic issues relevant for preparation of future GEF/UNDP rural biogas projects and the third set is provided for issues relevant for follow up activities on biogas technology promotion and development in Egypt.

Recommendations for immediate follow-up

	Recommendation
1.	UNDP CO in cooperation with EEAA should perform financial closure of the project and return the unspent balance of the GEF grant including the unspent amount earmarked for BDF
2.	The Bioenergy Association for Sustainable Development (BASD) should prepare a plan for rehabilitation of at least part of the biogas installations that had been found out of service
3.	The Bioenergy Association for Sustainable Development in cooperation with universities should explore possible ways of repair and adjustment of burners commonly used in biogas installations
4.	UNDP CO should assist the Bioenergy Association to establish an online portal for biogas in Egypt in order to provide a common platform for academia researchers, BSP companies, investors and rural development decision makers.
5.	The Bioenergy Association should use the existing BSPs for data collection necessary for independent verification of the payback period for the newly installed biodigesters under the on-going ILO/NBK biogas activity in the Menya Governorate.
6.	The Biodigester Association should accelerate the work on development of product standards and elaborate a plan for the institutionalization of the quality control function for biogas digesters.
7.	UNDP CO should assist the Bioenergy Association for inclusion of representatives of the Egyptian Agricultural Extension Service on BSDA Board of Trustees. Involvement of AES will facilitate inclusion of agricultural extension officers in the activities under the on-going biogas programme financed by ILO/NBK
8.	UNDP CO should assist the Bioenergy Association to establish links with on-going biogas projects in other African countries for exchange of information and experience.

Recommendations for future programming of UNDP rural biogas projects

	Recommendation
9.	It is recommended that for rural biogas projects, UNDP in cooperation with the Governments of the projects' recipient countries, consider inclusion of ministries with authority in the agriculture and land reform areas. Such involvement is critical for future as well as currently implemented rural biogas projects
10.	UNDP should advise the recipient Governments of rural biogas projects to consider establishment of a National Biogas Programme in order to improve the political visibility and ensure horizontal integration of actions and interests across the relevant sectors and line agencies
11.	In formulation of rural bioenergy projects, UNDP and the recipient Governments should ensure setting of milestones for measuring implementation progress and inclusion of SMART result indicators and targets. In addition to indicators for product and market creation, rural biogas projects should also have indicators for product and market development, such as adjustments of the biogas digester design, number of BSP assistance cases, number of jobs created, etc.

Recommendations for future rural biogas initiatives in Egypt

	Recommendation
12.	The Government of Egypt in cooperation with UNDP should explore possibilities for preparation of a follow-up project under funding from GEF and/or other interested donors
13.	UNDP CO and the GEF Small Grants Programme should assist the Bioenergy Association in linking the registered BSP companies and trained biogas engineers to local agri-businesses or associations in rural areas and facilitate creation of channels for a more systematic outreach to biodigester users and increase effectiveness of BSPs in delivery of technical advice provision of repair/maintenance services
14.	The Bioenergy Association should use the on-going ILO/NBK biogas initiative in the Menya Governorate for demonstration of rural household biodigesters as productive assets and engage with commercial banks and micro-finance institutions for development of micro-credit schemes with low interest rates.

INTRODUCTION

In line with the GEF Evaluation Policy, a Terminal Evaluation (TE) is undertaken at completion of the GEF-funded projects to assess their performance (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from the project, including their sustainability. TE is conducted to provide a comprehensive and systematic account of the performance of a completed project by assessing its design, implementation, and achievement of objectives. TE is also expected to promote accountability and transparency, facilitate synthesis of lessons learned, and provide feedback to allow the GEF to identify issues that are recurrent across the GEF portfolio.

This document presents results of the Terminal Evaluation of the UNDP/GEF project "Bioenergy for Sustainable Rural Development" (further referred to as the "BSRD Project). As a standard requirement for all projects financed by GEF, the TE has been commissioned by the GEF Implementing Agency, in this case UNDP Country Office (CO) in Egypt. The evaluation was conducted in accordance with the GEF Monitoring and Evaluation Policy[3], the Guidelines for GEF Agencies in Conducting Terminal Evaluations[4], and the UNDP Evaluation Guidelines[5].

Objective of the evaluation

The objective of the evaluation is to provide the project partners i.e. GEF, UNDP and the Government of Egypt with an independent assessment and comparison of planned *vis-à-vis* actually achieved outputs and outcomes, identify the causes and issues that contributed to the degree of achievement of the project targets, draw lessons that can improve the sustainability of benefits from the project, as well as contribute to overall improvement of UNDP programming.

The Terms of Reference (ToR) for this TE is provided as Annex 1 to this report.

Scope and methodology

TE will cover all activities undertaken in the framework of the project. The time focus of the evaluation is the implementation period of the project from November 2008 through December 2019. The geographic focus of the evaluation is Egypt.

TE used a combination of approaches to assess the achievements of the project from several perspectives and largely qualitative methods of data collection and analysis. The evaluation was conducted as follows:

Preparatory phase: The first step in the evaluation was a desk review of the most important documents covering the project design and implementation progress that provided basic information regarding the activities carried out to attain the desired outcomes and outputs and the actual achievements. The review was followed by preparation of questions and discussion

[3] The GEF Monitoring and Evaluation Policy, Global Environmental Facility, November 2010
[4] Guidelines for GEF Agencies in Conducting Terminal Evaluation for Full-sized Projects, Global Environmental Facility, April 2017
[5] Evaluation Guidelines, UNDP, January 2019

points aiming at gathering information from chosen respondents about attitudes, preferences and factual information linked to the performance indicators.

Evaluation Matrix: An evaluation matrix was constructed based on the evaluation scope presented in the ToR. The matrix is structured along the five GEF evaluation criteria for TEs and include principal evaluation questions. The matrix provided overall direction for the evaluation and was used as a basis for interviewing stakeholders and further review of the project implementation reports.

Apart from the evaluation questions on the relevance, efficiency, effectiveness, sustainability and progress to impacts, the evaluation matrix also included evaluation questions on cross-cutting issues relating to the promotion of values from a human development perspective, namely questions on gender equality and on social inclusion. The Evaluation Matrix is provided as Annex 2 to this report.

Stakeholder Interviews: This evaluation assignment was home based since evaluation field mission to Egypt was not possible due to international travel restrictions related to the coronavirus pandemic. Therefore, interviews with selected project stakeholders were conducted using the telecommuting modalities (i.e. Zoom, Skype and internet services).

The interviews were designed to solicit responses to predetermined questions aiming to obtain in-depth information about the key informants' experiences from the project implementation and their opinions on achievement of the planned results. They were developed in an open-ended interview format in order to allow selected project stakeholders and participants to feeely express their perception of the main issues related to the project implementation.

The evaluation criteria and the questions were used as a check list to raise eventual additional and/or more specific questions on the issues mentioned. Triangulation of results, i.e. comparing information from different sources, such as documentation and interviews, or interviews on the same subject with different stakeholders, were used to corroborate or check the reliability of the collected information. Through this approach, information obtained in the document review phase was amended and verified and missing data were obtained to learn about the opinion of the respondents and correctly interpret the information.

The list of people interviewed is provided as Annex 3 to this report.

Assessment of Evidence: After the data collection phase, data analysis was conducted as the final phase of the evaluation through review of additional documents that had been made available to the consultant by the project implementing partners as well as of other documents that the evaluator obtained through web searches and contacts with other relevant organizations a people active in the field of bioenergy. This process involved organizing and classifying the information collected, tabulation, summarization and comparison of the results with other appropriate information to extract useful information that relates to the evaluation questions and fulfils the purposes of the evaluation. This analysis included assessing the level of contribution of the project to the achievement of MDGs and alignment of the project objectives with the CPD and UNDAF. Contextual information was also gathered to assess the significance and relevance of the recorded performance and results.

The list of documents reviewed is provided as Annex 4 to this report.

Structure of the evaluation report

The structure of the TE Report follows the "Evaluation Report Outline" presented in Annex F of the ToR of the assignment (contained in Annex 1 to this report).

The 'Executive Summary' of the report is provided in the beginning of the report. The body of the report starts with introduction and development context of the project and continues with a short project description. This is followed by the chapter that sets out the evaluation findings presented as factual statements based on analysis of the collected data. The findings are structured around the five essential evaluation criteria and include assessment of the project performance against the performance indicators and their target values set out in the project results framework (as provided in the approved Project Document). This part further includes assessment of the project management arrangements, financing and co-financing inputs, partnership arrangements and strategies and the project monitoring and evaluation systems.

The final part of the report contains conclusions and recommendations substantiated by the collected evidence and linked to the evaluation findings. While the conclusions provide insights into identification of solutions to important issues pertinent to the project beneficiaries, UNDP and GEF, the recommendations are directed to the intended users in terms of actions to be taken and/or decisions to be made. This part of the report concludes with lessons that can be taken from the evaluation, including good or poor practices that can provide knowledge gained from the particular project circumstances (such as programmatic methods used, partnerships, financial leveraging, etc.) that are applicable to similar UNDP interventions.

Limitations of the evaluation

Due to the longer implementation period of the project and three extensions (11 years instead of the originally planned 5 years), some documentation from the early years of the project as well as implementing staff involved at that time were not available. Therefore, TE was only able to obtain full information and feedback from the documents covering the last 7 years of the project implementation and it was not possible to assess reactions and experience of some the project stakeholders and beneficiaries that had been involved in the first 4 years of the project but were no longer associated with the project at TE.

Due to the remote conduct of this evaluation it was not possible to visit the project stakeholders from rural communities such as private sector companies and farmers to make direct observations of the biodigester units installed with the project support.

The list of interviewed stakeholders is a representative sample of main relevant stakeholders for the project. Unfortunately, it was not possible to interview representatives of the NGOs that together with private sector companies facilitate diffusion of bioenergy technologies in Egypt.

PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

Project Context

With strong economic growth experienced over 2 decades, Egypt's primary energy consumption had grown at an average annual rate of 4.6%, primarily from rapid urbanization and associated increases in demand for electricity and transport services. The increases in energy demand had been met by increasing fossil fuel usage. In 2009, Egypt's fossil fuel consumption was 60 MTOE comprising 51% oil, 47% gas, and 2% coal.

Egypt has been a significant exporter of oil since the 1980s. Total oil production, however, had declined during 10 years since 1996 from 935,000 BBL/D to 685,000 BBL/D with oil demand steadily increasing to the extent that the oil production was being absorbed domestically. Since 1998, production of natural gas in Egypt had nearly tripled to the 2010 production of 60 BCM with domestic consumption being around 45.3 BCM. The electricity sector was the dominant gas consumer, accounting for 56% of the total gas demand. Since the early 1990s, the use of natural gas had been promoted by the Government in all sectors of the Egyptian society. This includes the industrial sector (29% with fertilizer and cement industries as the largest consumers), the petroleum sector (5%), and the residential sector (2%), where gas is delivered through low-pressure pipeline distribution systems and in LPG cylinders supplied by retailers. Residential sector demand, however, grew at a rapid pace based on the previous growth rates of 15% annually.

Egypt's energy policies aimed at a power development strategy while curbing GHG emissions through increasing the use of efficient fossil fuel generation technologies (such as combined cycle gas turbines and supercritical steam boilers), development of renewable energy resources (with a goal of having a 20% share of renewables by 2020), and increased efforts regarding the efficient use of electricity and other energy resources.

With growing demands for electricity throughout the country, blackouts were common in rural areas even though the energy needs for rural areas are generally only for lighting and basic electronic appliances. Nevertheless, the availability of cheap subsidized LPG had improved the quality of the energy supply in many rural areas. The underlying energy issues for the Government revolved around the subsidies for fossil fuels and, in the case of rural areas, LPG usage and subsidies to rural communities. With little incentive to utilize biomass as an energy source in rural areas, stocks of agricultural waste turned out to become an environmental hazard for rural communities. To control the growth of rice and wheat straw residues, local communities burn them in September and October, causing serious air pollution over much of Egypt's populated areas.

Brief Description of the Project

The project aimed at opening up a market for the development and dissemination of bioenergy technologies in Egypt to promote sustainable rural development and to reduce GHG emissions. This project was prepared in line with the objectives of the GEF-3 Operational Programme 6 "Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing

Implementation Costs" under the Strategic Priority # 4 "Productive Uses of Renewable Energy" contributing to the socio-economic development of the rural areas in general.

The goal of the project was to facilitate and accelerate the market development for new bioenergy technologies (BET) in Egypt, thereby promoting the sustainable socio-economic development of the rural communities in Egypt and reducing the negative global and local environmental impacts associated with the use of fossil fuels and the environmentally not sound management of the agricultural waste.

The objective of the project was to remove the technical, institutional, information, financial, and market barriers to developing the BET market in Egypt by (i) testing the feasibility and building the public confidence on BET systems and on the new business and financing models to facilitate their broader adoption, and on the basis of those models showing success, developing further the financial, institutional and market strategies for their large-scale replication; (ii) supporting the development and adoption of an enabling policy framework to implement and leverage financing for the recommended strategies; iii) building the capacity of the market supply side for marketing, finance and delivery of rural bioenergy services; and iv) institutionalizing the support provided by the project to facilitate sustainable growth of the market after the end of the project.

The project was approved for implementation by GEF CEO on 14 July 2008. The signature of the Project Document by the Government on 19 November 2008 has officially marked the start of the project implementation.

The GEF project grant approved for the project amounts to 3,000,000 US$ complemented with 2,160,000 US$ expected total co-financing composed of contributions from the Government and private sector. The total resources committed to the project at inception was thus 5,160,000 US$.

Project Baseline Data

The energy consumption pattern and energy mix used in rural areas of Egypt have changed considerably over the three decades prior to the project. With expansion of rural electrification, there has been a marked shift from the use of kerosene to electricity for lighting. At the project inception, about 92.4 per cent of households in rural areas were connected to the electricity grid, while the remaining 7.6 per cent (about 522,000 households, typically in more remote satellite villages) still used kerosene and LPG lamps for lighting, particularly in households with unreliable or no electricity. The per capita electricity consumption in rural areas varied considerably from 90 kWh/year to 760 kWh/year (the higher values were recorded in villages near urban areas). Brown and black outs, however, were common and the capacity of the grid is many rural areas were adequate to serve only the needs of lighting and some electronic equipment.

Surveys carried out in 1,700 households in rural areas of the Asyut Governorate and 1,500 households in the Fayoum Governorate have indicated that in average 2-3 LPG cylinders and 20-25 litres of kerosene was used per month for cooking and water heating in each household. The quantity of agricultural residues used was about 50 bundles (about 150 kg) per household

each month for cooking and baking. The level of subsidization of households was still considerable, ranging from about 33% for kerosene up to 60% for diesel and LPG.

There was also a marked shift from the use of agricultural residues and dung cakes for cooking, baking and water heating to the use of kerosene and LPG cylinders (butane gas). About 55 % of households used LPG cylinders while the use of kerosene and agricultural residues were about 69 % and about 17 %, respectively.

Agricultural residues were mainly used for baking and cooking, collected either free from the fields or, in some cases, brought separately. Typical fuels used at the rural households were stalk and cobs of maize, cotton stalk and dried cow dung. These fuels were typically used in traditional stoves and furnaces with estimated efficiency of only 10%. In the case of the use of fossil fuels, farmers commonly resorted to burning crop residues in the fields, resulting in a vast loss of energy besides causing direct local negative human health and environmental impacts. A study by the World Bank (2003) estimated that local damage costs due to the burning of agricultural residues in Egypt were approximately 0.7 billion EGP (about 150 million US$ in 1999/2000).

Uncontrolled burning of crop residues was responsible for massive air pollution during the harvesting seasons, in particular in October and November.

Project barriers

The GEF's experience has shown that the barriers to the promotion of bioenergy technologies generally relate to five market characteristics, namely policy, finance, business skills, information, and technology. The second Climate Change Program Study (CCPS2, 2004) as well as in the GEF-3 programming framework identified that removal of the market barriers *"reduce any additional implementation costs for renewable energy technologies (RET)s that result from a lack of practical experience, initial low volume markets, or from the dispersed nature of applications, such that economically profitable "win-win" transactions and activities increase the deployment of RETs".* The following text shows how these "five pillars" applied to the baseline situation in the bioenergy market in Egypt.

Policy barriers

Despite the policy framework, which in general was favourable for increasing the share of renewable energy in the country's energy balance, the Government and the related donor efforts (including GEF) focused primarily on the power sector, including large scale wind and solar thermal power. The opportunities of smaller, decentralized bioenergy technologies (BETs) consequently gained less attention. Moreover, fossil fuel subsidies provided an uneven playing field for competing BETs that did not have access to similar support.

On the institutional side, there was insufficient national-level coordination among different agencies carrying out activities related to BETs and lack of decentralized approaches involving many stakeholders that required considerable resources.

Finance barriers

A majority of the rural population depends on access to longer term financing options. On the basis of pre-feasibility studies conducted during the project preparatory phase, it was concluded that in selected market areas BETs could be economically feasible even in the challenging market environment with subsidized fossil fuel and electricity prices. However, the non-availability of suitable long-term credits proved to be the main barrier to financing BETs.

The main challenge in this regard was making such financing options available with the monthly financing cost of the new BET plants lower than the monthly spending on competing kerosine, diesel, LPG or electricity in order to make the overall investment in BETs more attractive and eventually allowing longer payback periods in comparison with instant upfront cash payment of the cost. The calculated lifetime of most new BETs was 15 years and the required payback typically between 5-10 years rather than under 5 years.

Business skills barriers

Despite some successful initiatives of local NGOs to promote BETs at the local level in the frame of available donor support, there was no adequate capacity within the existing institutions for widespread promotion of such technologies at a larger scale. There were no entities with the required technical, marketing and financial skills to promote investment into BETs on a maximum cost recovery basis and facilitate sustainable development of the market. Earlier grant-financed demonstration projects did not address lack of capacities for leveraging financing for the investments from different public, semi-commercial or commercial sources. Consequently, such projects did not facilitate construction of bioenergy plants at the adequate level of technical quality with associated after sale and technical support services and did not secure continuous positive experience with the technology and sustained growth of the market.

Information barriers

The use of modern BETs was still relatively new in Egypt at the project inception. In the specific case of biogas, the lack of experience and trust on the performance had been corroborated by negative experiences from previous demonstration projects. In particular, there were needs to prove the operational and financial feasibility of the new BETs both to the target private and public sector stakeholders in order to leverage stronger political support and financing for their further replication. This was not only related to the technical performance of a biogas plant itself, but to the whole chain of supplying the plant with required feedstock, the viability of the proposed business models and financing arrangements.

Technology barriers

Although the types of BETs promoted under this project had been widely implemented in other countries, additional technical assistance was required for studying and securing their proper operation and applicability in the Egyptian conditions and the envisaged type of the fuels used. There were also no standards and quality control requirements for new BETs in Egypt.

Project theory of change

A project's theory of change provides a basis for evaluation of the project resources, activities and results. TE will assess description of the project's theory of change including description of the project's outputs, outcomes, intended long-term environmental impacts of the project, causal pathways for the long-term impacts as well as implicit and explicit assumptions.

Earlier efforts to introduce modern gasification technologies in Egypt suffered from a technology-driven focus without adequate follow-up during operation and without recognizing or addressing broader policy, capacity, financing and institutional barriers that sustain market transformation. The BSRD Project design sought a different approach that incorporates lessons learnt from the previous attempts and initiates market transformation linked to the overall social and economic development needs of targeted rural communities.

The project aimed to contribute to:

a) Poverty alleviation in rural areas by promoting their economic and social development and by creating additional job opportunities;

b) Improvement of environmental conditions through better and environmentally sound management of agricultural and other domestic solid wastes; and

c) Reduction of GHG emissions through substitution of fossil fuels and improved management of organic waste.

In order to facilitate sustainable market transformation, the project's aim is to support introduction of parallel, mutually supportive measures that could create a sustainable demand in the new technologies through an enabling policy framework and other promotional measures designed for building confidence of the market. Furthermore, the project focused on meeting this demand by building the capacity of commercially oriented and professional supply chains able to offer high quality products and services in combination with access to affordable and sustainable financing mechanisms.

Expected results

Table 1 below provides a summary of the project baseline and expected results.

Table 1: BSRD Project baseline and expected results

Baseline	Expected results
Lack of confidence and the absence of sustainable and replicable models for implementation and financing of the targeted bioenergy technologies	Demonstration of the technical and financial feasibility and concrete implementation and financing mechanisms to facilitate the market development of the targeted bioenergy technologies
Absence of an enabling policy framework, effectively promoting rural bioenergy development	An enabling policy framework, effectively promoting rural bioenergy development in place
Inadequate capacity of the local supply chain to market and deliver sustainable rural bioenergy products and services, including financing	Enhanced capacity of the local supply chain to market and deliver sustainable rural bioenergy products and services, leading to the sustainable market growth
Inadequate information for adaptive management and project's final results and lessons learnt not captured and institutionalized for further market promotion	Adequate information for adaptative management Project's final results and lessons learnt captured and institutionalized for further market promotion

Project components

The BSRD project results framework in the approved Project Document consists of 4 substantive Outcomes and total of 21 substantive Outputs. All 4 substantive Outcomes have to be addressed to remove barriers and ensure a successful implementation of the project are summarized in Table 2 below.

Table 2: Components and outcomes of the project

Outcome No. and Description	Output No. and Description
OUTCOME 1: New business and financing models successfully introduced using appropriate technical solutions and demonstrating the possibility to construct and operate BET systems on a cost recovery basis	**Output 1.1:** An updated market analysis and finalized plans and operational criteria for the project's capacity building and financial support strategy **Output 1.2:** The initial awareness raising and marketing with the targeted clients successfully finalized (for replication the awareness raising and marketing under Outcome 3 **Output 1.3:** The Bioenergy Development Fund successfully announced and launched **Output 1.4:** The BET systems installed as per the project annual and final targets
OUTCOME 2: An enabling policy framework, effectively promoting rural bioenergy development adopted	**Output 2.1:** An updated study on the technical, economic and financial feasibility of the different bioenergy technologies for contributing to sustainable management of agricultural waste and its use for productive energy generation purposes **Output 2.2:** Enhanced awareness of and established policy dialogue with the key stakeholders and decision makers on the results of the study and the socio-economic benefits of BET systems **Output 2.3:** A draft policy paper highlighting the barriers and recommending improvements for the current policy framework for the development of the rural bioenergy market **Output 2.4:** Continuing consultations, promotional events, high-level meetings and other measures to facilitate the adoption of the recommendations
OUTCOME 3: Enhanced capacity of the local supply chain to market and deliver sustainable rural bioenergy products and services, including financing	**Output 3.1:** An updated survey and evaluation of the existing (or potential future) market players and their capacity to produce rural biomass energy related products and services **Output 3.2:** Channels and opportunities for information exchange, networking, match making missions and conditions for different local and foreign entities to explore opportunities for co-operation created **Output 3.3:** A manual for the development and financing of rural bioenergy projects in Egypt **Output 3.4:** An information and marketing package tailored for the targeted co-financing sources to support the BSPs and related awareness raising / match making finalized **Output 3.5:** Draft technical standards and certification system (to be adopted either as a voluntary or as a mandatory quality control scheme – see outcome 2) **Output 3.6:** Trained and, as applicable, certified product and service providers, including manufacturers, technicians etc. **Output 3.7:** A joint public awareness raising and marketing campaign with supply side product or service providers for the targeted customers
OUTCOME 4: Institutionalization of the support provided by the project, including monitoring, learning, adaptive feedback and evaluation	**Output 4.1:** An updated baseline study, against which the impact of the project can be measured **Output 4.2:** Project mid-term evaluation and other required reviews, including annual reports from continuing monitoring and evaluation of all the investment projects facilitated by the project **Output 4.3.:** Adding the topic of rural biomass energy increasingly into the curricula of the relevant academic and other educational institutions **Output 4.4:** A Biomass Energy Association or another applicable entity continue to serve as a focal point for further promotional activities on a self-sustaining basis **Output 4.5:** As needed, further elaboration and financing leveraged for applicable financial support mechanisms to continue the promotion of bioenergy, including, as applicable, carbon financing **Output 4.6:** Final project report consolidating the results and lesson learnt from the implementation of the different project components and recommendations for the required next steps **Output 4.7:** Final project evaluation

Main project stakeholders

Stakeholder engagement is an inclusive and continuous process between a project and those potentially impacted that encompasses a range of activities and approaches. It is arguably one

of the most important ingredients of a successful project delivery and therefore an essential element of this project.

A variety of stakeholders was identified at the project preparation stage. Depending on their respective areas of responsibility, some of them were expected to join the Project Steering Committee or be part of the committees established locally either at the Governorate or village level in order to plan and/or monitor the implementation of BETs in the field.

The most important stakeholders identified and consulted during the project preparatory stage are summarized in Table 3. A broader list of stakeholders from the Project Document including their expected roles in the project implementation is provided as Annex 5.

Table 3: Key stakeholders of the BSRD Project

Category	Name	Area of responsibility
Government	New and Renewable Energy Authority (NREA)	Expanding the use of renewable sources of energy in Egypt
Government	Rural Electrification Authority (REA)	Extension of electricity from the main grid to rural areas
Government	Organization for the Reconstruction and Development of the Egyptian Village (ORDEV)	Public participation in initiating, planning, financing, implementing and evaluating development projects
Government	Social Fund for Development (SFD)	Design and monitor poverty alleviation policies, and promote the institutional capacity to develop and/or modify social programmes
Government	Electric Utility and Consumer Protection Regulatory Agency	Studies on electricity prices and regulation of the construction of power project by private and other enterprises
Academia	Institute of Soil, Water and Environment (Agricultural Research Centre)	Experimental composting and biogas plant construction
NGO	Bassisa Community Development Society	Development of household biogas plants on the basis of shared costs and fee-for-service concept
NGO	Children and Development Society, Assuit	Community work in rural areas for implementing development projects
NGO	Coptic Evangelical Organization for Social Services (CEOSS)	Establishing household biogas plants
International	International Centre for Environment and Development (ICED)	Implementation of projects on solid waste management
	MISR Project (Government of Egypt/UNDP-Cairo)	Project on rural development (especially poor areas) and provision of services and infrastructure
Foreign	The Energy and Resources Institute of India (TERI)	Technical assistance (consulting services and equipment manufacturing)

FINDINGS

This section provides a descriptive assessment of the achieved results. In addition, several evaluation criteria are marked in line with the requirements for GEF Terminal Evaluations.

Analysis of the project results framework

The project results framework contained in the Project Document approved for implementation (i.e. the version signed by both UNDP and the Government of Egypt) is composed of 4 substantive Outcomes and total of 21 substantive Outputs, listed in Table 2 in the previous section. Each Outcome addresses a particular barrier to the effective uptake of bioenergy technologies in Egypt.

Specifically, Outcome 1 is related to demonstration of the technical and financial feasibility and concrete implementation and financing mechanisms while Outcome 2 is dedicated to development of an enabling policy framework for rural bioenergy development.

Outcome 3 was developed for building capacity of the local supply chain for delivery of rural bioenergy products and services, and the purpose of Outcome 4 is institutionalization of the support provided by the project, including monitoring, learning, adaptive feedback and evaluation.

A simplified results framework, used in the Mid-Term Review (MTR) and in the project reporting, has the same 4 substantive outcomes but only total 18 outputs. The same report does not provide any comment as to why and by whom the decision was taken to reduce the number of outputs. Nevertheless, the results framework listed in MTR is analysed in the text below.

Overall, there are logical links between the overall Project Objective and the four substantive Outcomes. Despite the basic logical structure, a more detailed analysis of the results framework revealed several internal inconsistencies related to the performance indicators. Results of this analysis is summarized in Table 4 below.

Table 4: Analysis of the project performance indicators

Result	Indicator Target	Comment
Objective: To remove the technical, institutional, information, financial, and market barriers to developing the bioenergy technology (BET) market in Egypt	The level of confidence on modern BET as means to contribute to rural energy needs The market growth of BET The level of supportive framework conditions in place sustaining the market growth after the end of the GEF project High level of confidence Average 20% market growth at the end of the project Supportive policy, including required financial and fiscal incentives in place to sustain the market growth	
Outcome 1: New business and financing models successfully introduced using appropriate technical solutions and demonstrating the possibility to construct and operate BET systems on a cost recovery basis under a supportive and enabling policy and financing environment	The level of confidence on modern BET and the implementation mechanisms promoted The operational and financial data of the systems installed. The level of customer satisfaction The first pilot bioenergy systems constructed and operated by professional "Bioenergy Service Providers" on the basis of maximum cost recovery. At least 90% customer satisfaction on the new systems	
Output 1.1: An updated market analysis and finalized plans and operational criteria for the project's capacity building and financial support strategy.	Finalized, updated market analysis, plans and operational criteria for the project's capacity building and financial support strategy Same as indicator	The indicator and target are repetition of the Output description
Output 1.2: The Biomass Energy Support Fund (BESF) scheme successfully announced and launched	Number of applications received and approved 50 family scale biogas plants and 2 community scale biogas plants received and approved	The target for the first year of the project only
Output 1.3: The BET systems installed as per the project annual and final targets	Number of systems constructed At least 1000 family scale, 10-20 community scale, 2 farm scale biogas systems and, 2 gasification systems and 1-3 additional biomass combustion or, as applicable, gasifications plants constructed and commissioned by the end of the project	The indicator description is not specific enough
Output 1.4: A mid-term and final monitoring and evaluation report of the systems constructed	Report finalized The results compiled, analyzed and disseminated	The Output is related to institutionalization of the project support thus belongs under Outcome 4
Outcome 2: An enabling policy framework, effectively promoting rural bioenergy development adopted	An enabling policy framework for promoting sustainable rural biomass energy adopted, including: • Recognition of the BET and other renewable systems in official Gov't documents as the first option to be studied and considered for meeting rural energy needs, whenever technically and economically feasible • A level playing field for BET systems to compete with subsidized fossil fuels created and, as applicable, introduction of eventual additional financial or fiscal incentives to support BETs on the basis of their socio-economic and environmental benefits • A supportive regulatory framework for managing the relations between the bioenergy service providers and the customers; Adoption of adequate product standards and quality control mechanisms. The content of the policy actions, legal and regulatory changes adopted	
Output 2.1: Enhanced awareness of and established policy dialogue with the key stakeholders and decision makers on the socio-economic benefits of BET systems	The PR material produced The list and output of consultations held A project presentation package finalized Initial meetings and consultations with the key stakeholders and decision makers finalized within the first 6 months of the project. Enhanced awareness of the general public through programs and articles in public media, workshops etc.	The indicator is poorly worded
Output 2.2 A draft policy paper highlighting the barriers and recommending improvements for the current policy framework for the promotion of rural bioenergy systems	The status of the document The draft policy paper finalized	The indicator is a repetition of the Output description. Better indicator would be "Number of recommendations in the policy paper"
Output 2.3: Continuing consultations, promotional events, high-level meetings and other measures to facilitate the adoption of the recommendations made	The status and level of policy dialogue The required measures to facilitate the adoption of the recommended improvement of the BET policy environment finalized	The target value is poorly worded and does not measure the indicator

Result	Indicator Target	Comment
Outcome 3: Enhanced capacity of the local supply chain to market and deliver sustainablerural bioenergy products and services, including financing	Number of identified and trained "Bionergy Service Providers" (BSPs) capacitated to continue to operate on a self-sustaining basis after the end of the project The level of follow-up activities of the trained BSPs The capacity of at least 20 local entities to serve as BSPs built The follow-up activities and business of the trained BSPs show an increasing trend, leveraging financing from a variety of sources	The target value of the 2nd indicator does not measure the indicator
Output 3.1: An updated survey and evaluation of the existing (or potential future) market players and their capacity to produce rural biomass energy related products and services	Status of the survey An updated survey and capacity evaluation finalized	The indicator is a repetition of the Output description. Better formulation would be "Number of market players assessed in the survey"
Output 3.2: Channels and opportunities for information exchange, networking, match making missions and conditions for different local and foreign entities to explore opportunities for co-operation created	Number of contacts facilitated Project web site established including links to relevant information. At least one international, bioenergy workshop in Egypt and 5-10 matchmaking missions facilitated by the project	The target values do not measure status of the indicator
Output 3.3 A manual for the development and financing of rural bioenergy projects in Egypt	Status of manual Finalized manual in Arabic and in English for developing and financing of rural bioenergy projects in Egypt	The indicator is a repetition of the Output description. Better formulation would be "Availability of the manual in Arabicand English"
Output 3.4: An information and marketing package tailored for the targeted co-financing sources to support the BSPs and related awareness raising / match making finalized	Availability of the information and marketing package Number of meeting and financial matchmaking events organized Information and marketing package about BET systems to potential financing institutions finalized Contacts created between the BSPs and with at least 5 new promising co- financing sources in addition to the SFD	
Output 3.5: Draft technical standards and certification system (to be adopted either as a voluntary or as a mandatory quality control scheme – see outcome 2)	Status of the technical standards/ requirements and a certification system Technical standards or requirements and a certification system developed and adopted (see outcome 2) both for hardware and for service providers in the distribution chain	The indicator is a repetition of the Output description. Better formulation would be "Availability of technical standards and a certification system"
Output 3.6: Trained and, as applicable, certified product and service providers, including manufacturers, technicians etc.	Number and type of people trained Verified results of the training through a certification scheme At least 100 people trained and, as applicable, certified from the supply chain in order to build up their technical, management and marketing, plant operation and maintenance and/or financial engineering skills (the scope of training depending on the target group)	No target value for the 2nd indicator
Output 3.7: A joint public awareness raising and marketing campaign with supply side product or service providers for the targeted customers	The number of LoIs received The number of LoIs received correspond to the targeted amount investments	The target is not specific for measurement of the indicator
Outcome 4: Institutionalization of the support provided by the project	Level of support available at and after the completion of the project Continuing promotion of bionenergy activities in Egypt after the end of the project on a self-sustaining basis	The target is not specific for measurement of the indicator
Output 4.1: Including rural biomass energy increasingly into the curricula of the relevant academic and other educational institutions	Level of inclusion of bioenergy into the relevant curricula Rural biomass energy increasingly included into the curricula of the relevant academic and other educational institutions	Indicator and its taget value not specific for measurement of achievement of the output. Better formulation would be "Number of academic institutions with rural energy in the curricula"
Output 4.2: A Biomass Energy Association or another applicable entity continue to serve as a focal point for further promotional activities on a self-sustaining basis	Existence and continuing effective operation of a bioenergy focal point after the project A rural bioenergy focal point established and continue its effective operation also after the project	The target value does no measure the status of the indicator
Output 4.3: As needed, further elaboration and financing leveraged for applicable financial support mechanisms to continue the promotion of bioenergy	Continuing availability of the required financial support, when needed Adequate financial support mechanisms established and continue to operate after the end of the project	The indicator is not specific for the output and the target value is not measurable
Output 4,4 Final project report and the associated promotional material and events	Final report and the related promotional material and events completed The report and the related promotional material and events The completed	The indicator and the target value are the same. The indicator should be "Availability of …."

In addition to the inconsistencies summarized in the above table, there is consistent absence of specific time deadlines for achievement of outputs. The project results matrix does not contain a column with mid-term targets for the project performance indicators. This was particularly detrimental for establishment of the project financial mechanism (Output 4.3) that should have been prioritized for early implementation. The absence of time deadlines and mid-term project targets precludes use of the results matrix for prioritization of results and appears to be one of the main deficiencies in the project design.

Although the structure of the results framework was consistent with the project's theory of change and the design of individual Outcomes and Outputs was aligned with the overall Project Objective, there was lack of clear relation between several indicators and their respective performance targets. The project results framework did not capture the global environmental benefits in terms of expected GHG reduction.

In summary, the project results matrix contains several inconsistencies that hindered the reporting on project progress, in particular the PIRs, and use of the results matrix as a tool for monitoring the project progress.

Risks and assumptions

Identification of risks enables the implementing partners to recognize and address challenges that may limit the ability of the project to achieve the planned performance outcomes. The approved Project Document defined 2 external and 7 internal risks. Description of the identified risks and the proposed risk mitigation measures are summarized in Table 5 below.

Table 5: Risks of the BSRD Project identified at the project inception

Risk type	Risk description	Proposed mitigation measures
External	Enabling policy framework for promoting biomass energy technologies does not develop at the desired speed (regulatory risk)	
External	General investment climate in Egypt	
Internal	Poor co-operation between project stakeholders	Establishing a PSC as a main body to co-ordinate the project activities with other ongoing activities, as and discuss and propose legal and regulatory interventions to promote the use of biomass as energy source
Internal	Inadequate project implementation	Taking into account requirements for experience and knowledge of biomass energy technologies as well as proven track record on promoting and managing projects while defining the Terms of Reference for the project manager and the other project personnel
Internal	Cost overrun and time delays of the first pilot projects (completion risk)	Careful selection of contractors and adequate terms and conditions of the contracts to secure timely provision of the services needed
Internal	Use of inappropriate technologies (technology risk)	Careful selection of BET systems that are suitable for the chosen locations, and for the energy demands of the recipient communities
Internal	Non-participation of the local communities	Empowerment of village committees and their participation at all stages of the project implementation combined with adequate awareness raising about the socio-economic benefits of BET
Internal	Sensitivity of the financial feasibility of the projects to the estimated value of the residues of the anaerobic digestion as fertilizers and availability and price of the feedstock for both anaerobic digestion and for possible larger biomass gasification or combustion plants	Adequate market analysis before making the investment decision as well as longer term fuel supply contracts for larger bioenergy plants
Internal	Non-payment of the final beneficiaries for the services	Making sure that adequate contractual arrangements are in place with the end users, by awareness raising on the importance of the "fee-for-service" model in creating new job opportunities and in improving the living conditions of the villages in general, as well as availability of a mechanism for cost recovery in place from the start
Internal	Lack of detailed knowledge of biomass energy activities in Egypt	Development of an inventory and assessment of the types and amount of wastes which will facilitate future biogas unit design and installations
External	Delay in project implementation due to the current political circumstances	

According to the standard practice of GEF-funded projects, the level of risks should be rated in terms of impact and probability and critical risks should be designated for monitoring during the project implementation. Such rating of the risks was not provided in the Project Document.

As a standard practice of UNDP-implemented projects, a risk log based on the initial risk analysis is established in UNDP ATLAS and regularly updated with new risks (if identified) added to the risk matrix. Management of risks rated as critical (i.e. when both impact and probability are high) together with the mitigation measures undertaken are reported in the annual Project Implementation Reviews (PIRs).

PIRs from the period 2010-2012 were not available for TE. The 2013 PIR does not report any critical risks while the 2014 PIR mentions as critical delays in development of the enabling policy framework. Since adoption of an enabling policy framework effectively promoting rural bioenergy development was defined as Outcome 2 of the project, this risk should have been classified as internal at the project outset and relevant risk mitigation measures should have been proposed. The 2015 PIR mentions as critical risk the transfers to the financial vehicle but does not mention any mitigation measures. The subsequent PIRs for 2017-2019 do not report any critical risk management.

It comes as a surprise that inability to establish the Bioenergy Development Fund (BDF) as the project-based financial mechanism had not been included amongst the project risks at the project inception and was declared as critical risk only in the 2015 PIR, 5 years after the project start. The experience from the project implementation proved that the failure to launch BDF as the project financial vehicle was a major factor for non-achievement of all planned results under Outcome 4. Moreover, there were no mitigation measures proposed for the risk of slow development of enabling policy frameworks for promotion of BETs.

It is the opinion of the evaluator that the risk identification and management was not comprehensive enough. In particular, the inability to establish the proposed financial vehicle and the consequent failure to mobilize additional funds for the biodigester installations should have been identified as critical risk at the PIF/PPG stage.

Lessons from other relevant projects incorporated into project design

According to the BSRD Project Document, about 850 small biogas units (family type) had been installed in Egypt since the 1970s, through grants offered by donors and the Ministry of Agriculture as demonstration units. About 90% of the plants were of an Indian type, with a floating gas storage drum while the remaining 10% were based on various Chinese models with fixed domes. An evaluation carried out by DANIDA in 2000 concluded that about 50% of the biogas plants were not operating and a majority the operational plants did not produce the projected amount of gas[6].

The DANIDA evaluation identified lack of adequate technical backstopping and insufficient regular maintenance of the biodigester units as the main reason for several technical problems

[6] Reference to the DANIDA evaluation was taken from the BSRD Project Document

that occurred during the operation. Moreover, easy access to LPG and kerosene by owners of the biogas digesters located in peri-urban areas coupled with subsidies on LPG contributed to quick abandoning of the installed biogas systems as soon as the technical problems occurred.

The DANIDA assessment documented flaws of the "traditional" approach based on purely technical demonstration without establishing business and financing models that can make such programme more sustainable in a medium- to long-term.

Some experience was also gained by some local NGOs in construction and marketing household-type biogas units in selected rural areas through a revolving fund mechanism. The lack of resources, however, did not allow expansion of this initiative.

The lessons learned and experiences gathered from the previously implemented projects in Egypt have informed the design of this project. Since it was prepared as one of the very first GEF projects on biogas for rural development, only limited experience from similar projects in other countries (India, China) was available for consideration during the project preparatory phase.

Consequently, the BSRD Project was designed with parallel, mutually supportive measures to support establishment of commercially oriented supply chain able to offer high quality technical assistance and backstopping services during construction and operation of the biodigesters, coupled with a component to facilitate access to affordable and sustainable financing.

The evaluation concludes that the project design reflected to the extent possible the available experience and lessons learned from previous bioenergy projects.

Planned stakeholder participation

The Project Document called for involvement of stakeholders with respective mandates relevant to biomass energy. Section IV Part III of the Project Document contains a Stakeholder Involvement Plan based on a list of key stakeholders that were expected to be involved together with the description of their envisaged roles in the project. The stakeholder plan included a cross-section of stakeholders including a range of relevant Government ministries and their operating units. It was also claimed that several of these organizations would be consulted in different elements of the project.

The standard entry point for stakeholder involvement in a UNDP/GEF project is the Project Steering Committee (PSC). Some of the stakeholders identified at the preparatory phase were included as PSC members, in particular Government agencies with mandates in environment and energy, as well as representatives of academia, and participated in the Inception Workshop (IW) that was held in October 2010 and is considered the first meeting of PSC.

The most prominent roles in PSC were attached to the Ministry of Environment and the Egypt Environmental Affairs Agency (EEAA) as the custodians of energy policy in Egypt. Organizations associated with the Ministry of Local Development were also included in PSC, however, they played only marginal role in the implementation of the project.

Although the project was developed to assist smallholder farmers in rural areas, it is surprising that the Organization for the Reconstruction and Development of the Egyptian Village (ORDEV) was not formally involved from the very start of the project. A cooperation protocol

between EEAA and ORDEV was signed later (in 2013) to capitalize on the previous informal cooperation between the two agencies. Since ORDEV had a direct supervisory relationship with the Local Councils in all Egyptian Governorates, the cooperation with ORDEV enabled the project to establish a channel for awareness-raising and communication with potential beneficiaries in rural communities.

Despite the fact that previous biogas initiatives in Egypt were implemented through donor funding under the Ministry of Agriculture and Land Reclamation (MoALR), the latter was not involved in the BSRD Project at all. MoALR has a direct line of command over the agriculture extension officers who work at a local level and have direct links to the farmers. The training of end users by BSP companies under the project covered basic issues of bio-slurry utilization for crop cultivation but without linkages to specialized knowledge in this field possessed by the agricultural extension workers. Lack of involvement of the MoALR and the Agriculture Extension Services (AES) in the project implementation caused that farm- and location-specific information about ways to achieve benefits from bio-slurry use for crop cultivation was not systematically provided to the end user communities.

The prevalence of the public sector representation on PSC at the preparatory stage of the project could be explained by the fact that at that stage the project required stronger public sector contribution and support. Nevertheless, as the project progressed in implementation, the PSC membership was not substantially changed or amended to provide for a more balanced representation of the private and NGO sectors as the ultimate beneficiaries of the project.

Replication approach

The replication approach outlined in the project design was based on division of the project into two phases, namely the pilot phase and the follow-up phase. The pilot phase was set to support construction and commissioning of initial 50 household size biogas units and 1-2 community size units. The follow-up phase was designed to gradually complement the project funds by leveraging other sources of financing, including specific Government funds, commercial or banks and other to meet longer term replication targets of the project. Over the 5-year duration, the project, was expected to provide technically and financially efficient models for replication and further the adoption of the bioenergy technologies in the rural communities.

The longer-term replication potential had been estimated at up to 63,000 family scale, 3,800 community scale and about 70 farm scale biogas plants. Unfortunately, the project failed to demonstrate financial mechanisms required for achievement of the replication targets.

UNDP comparative advantage

UNDP is well equipped to assist the developing countries in addressing their needs and priorities due to its focus on poverty reduction, pro-poor economic policies and environmental sustainability. With its permanent presence in nearly 170 countries and long-term relationships between UNDP and the vast majority of nations, the Organization serves as a key bridge between the world-wide vision of development as a core UN pillar and its sustainable achievement in individual states and lives – offering the global partnership, support, collaboration, expertise, and often funding. Hence, the organization has tools to support countries in pursuing a balance of inclusive and sustainable growth patterns.

The essence of UNDP's comparative advantage for the GEF-funded projects is embedded in its global network of country offices, its experience in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation. In addition to UNDP proven track record on promoting, designing and implementing activities consistent with the GEF mandate and national sustainable development plans of the developing countries, UNDP also has extensive inter-country programming and implementation experience.

A key part of UNDP's comparative advantage is the role of knowledge management broker, i.e. in accumulation of first-hand experience from implementation of projects in specific technical areas. As one of the implementing agencies for GEF, UNDP has been expanding its work on energy efficiency for achievement of the Sustainable Development Goals (SDGs).

Besides the specific technical areas of climate change and renewable energy, UNDP has a long-standing experience in developing and implementing coherent packages of "hard" and "soft" interventions that make technology transfer successful when complemented by targeted strengthening of relevant human and institutional capacities.

Linkages between the project and other interventions within the sector

The BSRD project was expected to link with the MISR Programme – an initiative of the Ministry of Planning, funded by several donors and implemented by UNDP, to support participatory planning and decentralization in the implementation of rural development activities in Egyptian villages. The 6-year project focussed on ten rural areas to provide them with services and infrastructure. The MISR Programme was expected to provide the BSRD Project with an established mechanism for participatory planning as the main venue for promoting BETs in rural communities. Although the MISR programme was implemented by UNDP, there were no reported links between the two projects.

Almost in parallel with the BSRD Project (October 2010 – December 2016), the African Development Bank implemented the Rural Income and Economic Enhancement Project (RIEEP) in Egypt. The development objective of RIEEP was to improve the socio-economic livelihoods of economically active rural smallholder farmers. RIEEP consisted of three complimentary components: 1) providing access to finance, 2) strengthening agribusiness lending by building capacities of partner financial intermediaries, and 3) strengthening the value-chain component through building capacities of farmer associations and other stakeholders. Under its Component 1, RIEEP provided total 3,429 small loans and 78,264 micro-loans to rural small-holder farmers and micro-entrepreneurs. Initially, the RIEEP on-lending was channelled mainly through the Social Fund for Development (SFD) direct lending arm to NGOs. In 2013, RIEEP concluded a contract with the National Bank of Egypt for on-lending through NGOs to end-beneficiaries and another contract with Banque Misr for direct financing of micro-entrepreneurs[7].

[7] Rural Income and Economic Enhancement Project: Project Completion Report, African Development Bank, 2017

Geographically, RIEEP provided small- and micro-loans mainly in Upper Egypt (the Fayoum and Minya Governorates), i.e. in the same area where BSRD Project supported construction of biodigesters. At its early stage, RIEEP worked with SFD that was also supposed to be used by the BSRD Project. Therefore, it comes as a surprise that there are no records of any interactions between the two projects, particularly given the fact that RIEEP was successful where BSRD failed, i.e. in extending innovative financing mechanisms to rural micro-enterprises.

Management arrangements

The project was implemented in line with the established UNDP procedures for National Implementing Modality (NIM) with UNDP CO as the Implementing Agency (IA) and the Egyptian Environmental Affairs Agency (EEAA) as the Executing Agency (EA).

GEF Implementing Agency

The responsibility of the UNDP Country Office (CO) in Cairo as IA for the project, included monitoring and ensuring appropriate use of UNDP-GEF funds to assigned activities, timely reporting of implementation progress through the corporate reporting mechanisms, as well as undertaking of mandatory and non-mandatory evaluations and audits. In this context, UNDP provided necessary backstopping to ensure proper implementation progress, provided feedback to various products and documents and ensured the project's outputs contribute to the country programme outcomes and to GEF-UNDP priorities. Through participation in the Project Steering Committee (PSC), UNDP CO solicited national ownership of the project and ongoing stakeholder engagement and sustainability.

In 2011-2014, there were cracks in the relations between UNDP CO and GoE that added to the negative effect of the unstable political situation in the same period. Despite the UNDP CO ensured the project progressed well with respective the components on the biogas technology demonstration and capacitation of the private sector entities. However, the impaired relations between the two Implementing Partners could have had negative effect on the project component on establishment of financing for biodigester installations.

Executing Agency/Implementing Partners

Being the Executing Agency for the project, EEAA assumed the responsibility for liaisoning and co-ordination with relevant Ministries and public administration bodies and the agencies and authorities affiliated to them with stakes in the project.

The Project Document envisaged establishment of a Project Management Unit (PMU) within the Executing Agency (EEAA) for the day-today management of the project. PMU was to be led by a properly qualified and experienced Project Manager (PM) to be selected jointly by the EEAA and UNDP CO, in consultation with the UNDP/GEF Regional Co-ordination Unit.

After the official starting date of the project (marked by the signature of the Project Document in November 2008), there was about 17-months delay of the actual start of the project activities due to difficulties to recruit the Project Manager. Since Egypt did not have a track-record and great expertise in the area of bioenergy, finding a qualified person to manage the BSRD Project was found extremely challenging. In April 2010, the project finally solved this issue in

appointment of the EEAA CEO as the National Project Director and hired a Project Officer and a part-time Financial Manager in order to start implementation of the project.

The political instability and frequent changes of senior government officials during the Arab Spring (since January 2011) made the decision-making process very slow and negatively impacted the project progress. Negative impact of external factors was aggravated by the departure of the project first PM in August 2013 for personal reasons. The replacement was appointed in 2014 following a relatively long recruitment process. Even with PM in place, the UNDP CO recommended to strengthen PMU with recruitment of a part-time technical expert in order to return the project on the implementation track as soon as possible. Unfortunately, the dire political situation postponed this action.

With the new PM in charge, the project progressed well despite a change in the management at EEAA in 2014. Nevertheless, frequent changes in the management of many Government entities during the period of political instability required extra effort from PMU as it had to repeatedly introduce the project and explain its purpose to newly appointed officials and obtain their approvals whenever required.

The second PM was on board until June 2016 when the project activities were concluded. However, the project was kept open in order to establish the Bioenergy Association as part of institutional sustainability.

It appears that the political instability and impaired relations between UNDP CO and GoE were the principal external factors that affected implementation progress in the first years of the project. Internal factors such as delays in recruitment of PMs and in establishment of BASD further aggravated the negative effect of the external factors.

Project Steering Committee

PMU managed the project under overall guidance of the Project Steering Committee (PSC) that was established to oversee and guide the project implementation processes, monitor the project progress, and to support the project in achieving targeted outputs and outcomes. PSC was chaired by the EEAA CEO, and its members included representatives of key ministries and other public agencies involved in the project as well as a representative of UNDP.

To effectively support the project, PSC was expected to meet at least twice a year. The actual number of PSC meetings was somewhat lower, as shown in Table 6 below.

Table 6: Meetings of the Project Steering Committee in 2013-2020

No.	Date	No.	Date
1	April 2013	7	8 March 2018
2	January 2014	8	3 May 2018
3	August 2014	9	5 July 2018
4	February 2015	10	1 November 2018

Minutes of the PSC meetings were prepared in Arabic but no English summaries were provided. Information about PSC meetings was taken from the annual PIRs.

In addition to PSC, the Project Document recommended to establish a Technical Group that may include representatives of NGOs, academia, donors and UN agencies, which have all

expressed interest in collaborating with the project. There is no information available whether the Technical Group was ever established.

Although in theory the role of a Steering Committee is complex, the two main guiding principles by which a PSC should function are as follows:

- Support the Project Manager
- Give Strategic Direction to the project implementation

The evaluator found the established managerial arrangements in line with the Project Document and considers them adequate for the size and complexity of the project. However, lack of information about the PSC meetings did not allow to make assessment to what extent PSC fulfilled its expected functions of provision of strategic direction and operational oversight to the project.

Adaptive management

GEF terminal evaluations are expected to assess adaptive management in terms of ability to direct the project implementation through adapting to changing conditions outside of control of the project implementing teams. The adaptive approach involves exploring alternative ways to meet project objectives and implementing one or more of these alternatives.

There were two major cases of adaptive management in the BSRD Project. The first case occurred in 2013 following the study tour of the project team to India. As a result of the study tour, the originally signed contract for procurement of poultry farm digesters was cancelled and replaced with a new contract for digester units for cattle farms. In this case the project reacted well to change the focus upon findings that effectiveness of bio-digestion of poultry dung would be sub-optimal due to low carbon content of the biodigester feedstock.

The second case of adaptive management was much more complex as it related to the project extension request submitted in 2015. The reason for the extension was insufficient progress towards establishment and capitalization of the Bioenergy Development Fund (BDF) as a financial support mechanism for the development of rural bioenergy market.

The BSRD Project Document defined BDF as a financial mechanism to provide equity, loans or applicable credit enhancement instruments such as partial grants or guarantees and to leverage additional financing for the targeted BET investments from various public and private lending institutions. BDF was expected to be initially capitalized with US$ 1.76 million from the Government (MoE/EEAA), US$ 1.2 million from GEF and US$ 250,000 from a private sector corporation. Section V of the Project Document provided the description of BDF and stipulated the required steps for selecting the fund manager, setting up the structure of the fund, operational guidelines, rules on transfer of GEF funds and oversight required, and exit of the project from BDF.

At the time of the extension request submission, the only major milestone achieved was the legal establishment of a Bioenergy Association for Sustainable Development (BASD) as the entity entrusted with BDF management. However, no information was provided on the composition or capacity of the Board of BASD, operational and staffing structure, due diligence on BDF lending capabilities and on financial management guidelines. At that time, the UNDP

CO was already in possession of the full amount of the Government part of funds allocated for the BDF initial capitalization. However, some Government stakeholders expressed reservations about transfer of these funds to the new entity without knowing exactly how the entity would operate.

According to the Project Document, BDF was expected to have been put in place early on during the project implementation and its operation monitored for several years. From this point of view, the lack of information on the status, operations and capabilities of the new entity and serious deviations from the fiduciary and operational criteria for its establishment stipulated in the Project Document 5 years after the start of the project was a serious deviation from the approved project implementation strategy. Transfer of the GEF part, i.e. US$ $1.2 million to the new entity so late in the project and then close the project (and associated UNDP/GEF oversight) soon thereafter posed a major reputational risk to UNDP.

Moreover, it turned out that transfer of GEF funds from UNDP to the new mechanism was not in line with the valid UNDP rules and regulations. This was a general UNDP case not specific to Egypt, as few UNDP projects in other countries faced the same issue. UNDP-GEF worked with UNDP-OFRM (Office of Financial Resources Management) to find a solution but it took some time as it was necessary to update the UNDP rules and regulations for implementation of projects.

Following extended discussions between UNDP and GoE, the partners agreed to utilize the Performance Based Payment (PBP) mechanism for low-value payments (up to $ 5m). At that time, this new modality was just approved by the OPG and guidance for its use was expected to be available in the UNDP Programme and Operations Policies and Procedures (POPP). In this case, a third party, namely the Social Fund for Development (SFD) , would be contracted to host and operate the mechanism and become thus the Responsible Party as per UNDP rules.

In order to define the roles and responsibilities of the involved agencies, a tripartite cooperative agreement was drafted between SFD, EEAA and the Bioenergy Association. However, official signing of the agreement was delayed as the Government decided to replace SDF with the Micro, Small and Medium Enterprises Development Agency (MSMEDA). The agrrement was finally signed between MSMEDA, the Bioenergy Association and EEAA in March 2019. Unfortunately, the official conclusion of the cooperation document did not have any effect on the capitalization of the financial mechanism within the project timeframe.

Having reviewed the available documentation and obtained additional clarification through interviews with UNDP RTA and PTA, the evaluator found two main reasons for inability to establish and operationalize the financial mechanism.

Firstly, although UNDP transferred the first tranche for BDF to the project, there was no attempt to activate BDF after the first tranche and monitor its operation according to the Project Document. Had it taken place early in the project, there could have been time to analyse conformity of the BDF setup with the Project Document and UNDP rules. Instead, the proposal to operationalize BDF was submitted too late in the project and in addition to the still unresolved fiduciary issues it was also not clear how BDF and the technology transfer and capacity-building components of the project would interlock at such late stage of the project.

The second and more serious issue was the fact that at the time of approval of the BSRD Project (2008), UNDP did not have in place administrative policy for establishment and operation of such financial mechanism proposed for the project. As a matter of fact, UNDP approved rules and guidance for an on-granting modality within its projects only in 2018 while administrative rules and guidance on a guarantee/loan mechanism were still under discussion of the UNDP senior management at the time of preparation of this Report.

It appears that at the time of the BSRD Project inception, there was a mismatch between the GEF-3 requirement to provide on-granting and guarantee/loan support to the projects and the administrative capacity of UNDP to effectuate such requirement. The discord had a negative impact both on efficiency and effectiveness of the project implementation.

Partnership arrangements

During the initial years of implementation, the BSRD project established a number of important partnerships that were conducive to implementation of the technology transfer and capacity building components.

In 2013, the project formalised a cooperation protocol with the Ministry of Local Development (MLD) and the Organization for Reconstruction and Development of the Egyptian Village (ORDEV). The latter has a long track record of acting as a ministerial committee responsible for planning of rural development and coordination of various governmental services. The partnership with ORDEV helped the project in outreach to potential beneficiaries of the project through establishing a channel for awareness-raising and stakeholder communication.

Another important partnership was a cooperation protocol signed with the Ministry of Housing[8] for using a network of 62 specialized government training centres located all over Egypt for the capacity building component of the project.

In addition to the two public agencies engaged in rural development, the project also opened dialogue with several entities of the academic sector, namely the Faculty of Engineering, Ein Shams University, and Faculty of Biotechnology, MSA University, for cooperation in the field of training and quality control. A cooperation protocol was also signed with the Faculty of Agriculture, Minia University, for technical assistance related to analysis of bio-fertilizer and optimization of its use in crops cultivation.

The project approached a number of prominent non-governmental organizations (NGOs) to work with it in the area of public awareness, collection of applications from interested rural households and installations for the second phase of the project.

In order to reach out to indigenous NGOs, the project created a strong alliance with the GEF Small Grants Programme (SGP) in Egypt that had a long record of administering a small grants programme for NGOs and community-based organizations (CBOs) in recognition of the key role they play as a resource and constituency for environment and development concerns.

[8] In September 2015, the Ministry of Housing was merged with the Ministry of Urban Communities and renamed to become the Ministry of Housing, Utilities and Urban Communities,

Initially, the project PMU organised several meetings with NGO/CBO representatives and SGP officials to review and improve technical and financial aspects of proposals received by SGP for support to installation of biodigesters. Later, the cooperation with SGP helped to build the capacity of the NGO grantees by providing on-job training before extending assistance to owners of biogas household units.

The project was less successful in establishment of partnerships with private sector entities. The initial 17-months delay in the project operational start had a negative effect on the co-financing that was expected from the private sector. Despite their pledges for co-financing from the project inception phase, private sector companies did not want to wait for the delayed start of the project implementation and the co-financing contributions for the project from the private sector were not realized.

While the project was successful in establishment of partnerships with relevant domestic stakeholders, it did not create sufficient linkages with organizations and projects outside the country. In parallel with the BSRD Project, the Africa Biogas Partnership Programme (ABPP) was implemented in six African countries (Ethiopia, Kenya, Tanzania, Uganda, Burkina Faso and Senegal) with the aim of biogas market development. Moreover, there were also stand-alone biogas projects in Benin, Cameroon, Rwanda, Zambia and Zimbabwe. Unfortunately, no information is available about any interactions between the BSRD Projects and the above initiatives.

In April 2016, ABPP in collaboration with the with the Global Alliance for Clean Cookstoves organized the Africa Biogas and Clean Cooking Conference in Addis Ababa[9]. More than 160 participants attended the conference, representing national, regional and local governments, multilateral agencies, knowledges institutes, global associations, businesses, NGOs as well as individual consultants. The focus of the conference was to share knowledge on maximising the benefits of biodigesters and contribute to improve implementation practices and scaling up market and sector development for biodigesters. Fourteen African countries were represented at the conference, however, there was not a single participant from Egypt.

Due to lack of interactions with similar biogas initiatives implemented in parallel in other countries, the project did not capture important experience related to establishment of enabling policy and regulatory frameworks and operationalization of sustainable financing mechanisms for biogas market development.

Project finance

The GEF grant for this project was approved at 3,000,000 US$ and together with expected co-financing of 2,160,000 US$ the total cost of the project at inception was 5,160,000 US$. Table 7 below displays the breakdown of GEF grant expenditures by the years of the project implementation period.

[9] Conference Report, Africa Biogas and Clean Cooking Conference, 2016.

Table 7: Expenditures by years of implementation in US$ (as of 30 June 2020)

Act.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2019	2020	2009-2020
1	154.38	28,722.97	71,978.14	66,518.93	222,518.50	119,485.27	215,632.62	14,974.48	-	19,631.52	954.26	760,571.07
2	-	1,528.75	-	-	3,432.87	5,591.06	44,088.94	45,640.07	-	2,845.62	-	103,127.31
3	-		111.11	1,952.09	19,672.78	175,863.55	261,742.24	859.81	-	450.41	-	460,651.99
4	-		1,191.34	8,706.70	9,851.64	8,723.15	85,880.88	74,950.78	1,021.27	663.00	-	190,988.76
5	-	5,210.53	18,573.80	50,245.34	58,043.22	50,637.67	77,768.83	2,253.20	38.79	1,738.09	-	264,509.47
Total	**154.38**	**35,462.25**	**91,854.39**	**127,423.06**	**313,519.01**	**360,300.70**	**685,113.51**	**138,678.34**	**1,060.06**	**25,328.64**	**954.26**	**1,779,848.60**

For assessment of the financial disbursement patterns it has to be noted that the approved GEF grant was composed of two parts, namely 1,800,000 US$ for the technical assistance (TA) activities and US$ 1,200,000 for capitalization of the financial mechanism. As the latter part was unspent for reasons explained in below in the section 'Efficiency', only the TA part is further considered in this Section.

It follows from Table 7 that the total expenditures until the Mid-Term Review (2009-2012) was only 254,894.08 US$ (14.2%) of the TA portion of the GEF grant. The spending escalated in the following 4 years and at the end of 2016 the total disbursement during this 4-year period reached 1,497,611.56 US$ (83.2% of the total TA part). The total disbursements of the GEF TA grant for the entire project period reached 1,779,848.60 US$, that is 98.9%. The fact that three quarters of the expenditures was realized in 2013-2016 signifies that the project implementation gained a momentum after appointment of the 2nd PM. No expenditures were recorded in 2018.

Table 8 below provides comparison of the planned and actual expenditures by the project components.

Table 8: Planned and actual expenditures by the project components

	Planned US$)	**Actual (US$)**	**%**
Activity 1	640,000	760,571.07	118.8%
Activity 2	165,000	103,127.31	62.5%
Activity 3	465,000	460,651.99	99.1%
Activity 4	230,000	190,988.76	83.0%
Activity 5	300,000	264,509.47	88.2%
Total	1,800,000	1,779,848.60	98.9%

The above table shows that in comparison with the approved budget, the project spent almost 20% more on the biogas technology demonstration (Component 1) but only about two thirds of the allocated budget on assistance with the policy frameworks (Component 2). Lower spending was also recorded on the institutionalization of the support (Component 4). Total GEF grant expenditures on project management reached only 88.2% of the budget allocation for Component 5. However, additional 116,718.28 US$ were provided to this component by UNDP core budget, so the combined total expenditures on project management amounted to 381,227.75 US$,

Lower spending reflects the underachievement of Components 2 and 4. Although the total length of the project period was twice as long as expected, the total expenditures on project

management were only 27% higher than the planned amount. Overall, Tables 6 and 7 demonstrate sound financial management of the project.

The BSRD Project was designed to attract co-funding from various levels of the Government as well as from private sector. Table 9 below compares the planned co-funding at the project inception with the actually achieved co-funding at the completion of the project.

Table 9: Comparison of planned and actual co-financing by source (US$)

	Planned US$)	**Actual (US$)**	**%**
GEF	3,000,000	2,979,848.60	99.33%
UNDP	150,000	206,234.41	137.49%
Government	1,760,000	1,693,586.74	96.23%
Private	250,000	-	0.00%
	5,160,000	4,879,670	94.57%

It follows from Table 9 that the total co-financing almost reached the expected amount, despite the loss of private sector co-financing due to delayed start of the project implementation. The Government co-financing was provided for capitalization of the financial mechanism, however, the latter was not implemented.

Monitoring and evaluation: design at entry and implementation

M&E design at project entry

The Monitoring & Evaluation (M&E) Framework was in details described in the Project Document. The Framework consisted of the Project Inception Workshop, meetings of the Project Steering Committee, annual Project Implementation Reports (PIRs) as well as the Mid-Term Review (MTR) and the Terminal Evaluation (TE). Allocation of the total indicative cost for the M&E component was at the level of 200,000 US$, that is 6.7% of the total GEF grant.

Overall, the Evaluator found the M&E design suitable for monitoring the project results and tracking the progress toward achieving the objectives, with the exception of the deficiencies in the project results framework discussed in the section “Analysis of the project results framework” above. Also, the financial allocation for the M&E activities is considered adequate.

The design of M&E framework followed the standard M&E template for projects of this size and complexity and therefore is rated **Satisfactory (S).**

M&E at implementation

The main subject of the discussion here is the implementation of the originally planned components of the M&E plan. For the assessment of the M&E framework, the evaluator reviewed some of the project documentation related to monitoring and reporting, namely the annual Project Implementation Reviews (PIRs) and CDRs.

Inception Workshop: According to the standards of implementation of UNDP/GEF projects, it is expected to hold a project Inception Workshop (IW) within the first two months after the

official start of the project. IW was organized on 27 October 2010, i.e. almost two years after the official start of the project in November 2008 and 6 months after actual start of the project activities in April 2010. The main part of the delay was due to the protracted search for a qualified Project Manager, but the latter part of the time-lag was related to challenges in mobilising relevant stakeholders and raising the profile of the project.

There were almost 50 participants in IW, mostly involving representatives of relevant ministries, public agencies and academic institutions. The objective of IW was to help the Project Team and relevant project stakeholders to understand and take ownership of the project's goals and objectives, as well as to finalize the preparation of the project's annual work plan on the basis of the project's log-frame.

Annual Project Reports/Project Implementation Reviews (APRs/PIRs): The most important instrument in the monitoring of the project progress were Project Progress Reports (PPRs) prepared for the PSC meetings and Project Implementation Reviews (PIRs) prepared regularly with annual periodicity at the end of each GEF fiscal year (July to June). PPRs were not available for TE but based on the interviews it can be established that they were prepared as *ad-hoc* narratives summarizing progress achieved and highlighting issues for discussion by PSC.

PIRs provided a detailed account of progress made towards achieving the project performance targets set in the project results framework. PIRs for the initial (pre-MTR) period of the project were not available for TE. Unfortunately, there was no assessment undertaken in MTR on quality of the M&E activities as the MTR ToR did not request such assessment to be conducted.

PIRs covering the post-MTR phase of the project (the GEF Fiscal Years 2013-2019) were prepared in a standard structure and contain detailed reporting on progress towards performance targets at outputs, outcomes as well as the project objective levels. In line with the requirements, PIRs contain ratings and comments on project progress provided by PM, UNDP CO, the Government Implementing Partner and UNDP RTA. The overview of PIR ratings of progress towards the project Development Objective (DO) and Implementation Progress (IP) are summarized in Table 10 below.

Table 10: Summary of DO and PI progress ratings[10]

GEF Fiscal Year	Project Manager		UNDP CO		Government		UNDP RTA	
	DO	IP	DO	IP	DO	IP	DO	IP
2013	S	S	MS	S	S	S	MS	MS
2014	HS	HS	HS	HS	HS	HS	S	HS
2015	HS	HS	HS	HS	-	-	S	MS
2016	HS	HS	S	HS	-	-	S	MS
2017	-	-	MS	MS	-	-	S	MU
2018	-	-	MU	HU	-	-	MU	HU
2019	S	-	MS	MS	-	-	MS	U

[10] HS – Highly Satisfactory, S – Satisfactory, MS – Moderately Satisfactory, MU – Moderately Unsatisfactory, HU – Highly Unsatisfactory. Definitions of the ratings are annexed to the GEF PIRs.

It can be seen from the above Table that the DO and IP ratings provided by UNDP RTA were in many cases lower than the ratings by PM and UNDP CO, even in the years 2013-2016 when the project was progressing well with a majority of its activities. In 2015 and 2016, while PM and UNDP CO rated IP as HS, the IP rating by UNDP RTA was two steps lower at MS level, that reflected lack of progress with implementation of the on-granting financial mechanism.

The evaluator found the seven available PIRs compliant with the standard UNDP/GEF project cycle reporting tools and particularly detailed. Apart from a large section on development progress provided by the Project Manager, the reviews also contained concise summaries on implementation progress, management of critical risks, adjustments to project implementation plans and narratives on cross-cutting issues. For obvious reasons, PM ratings were not provided after the departure of the 2nd PM in 2016 but absence of inputs and ratings from the Government Implementing Partner since GEF FY 2015 is difficult to explain.

GEF Tracking Tools: Due to the lack of continuity in the project management from the side of UNDP CO, the GEF Tracking Tool at project inception was not available. GEF TT at MTR was provided but was found incomplete. The GEF Tracking Tool at project closure was still under preparation at the TE stage.

Independent Mid-Term Review (MTR) was planned to be undertaken at mid-point of the project., i.e. during 2011. Due to the initial delays in the project implementation, it was postponed by one year. The MTR data collection was conducted in September – December 2012 and the MTR Report was completed in February 2013. The feedback from MTR is discussed further below.

Terminal Evaluation: As a standard practice of UNDP/GEF projects, TE should be conducted at least three months prior to the project completion date. The last project extension was granted until 30 June 2019 and unofficially prolonged by another 6 months. TE was commissioned in April 2020 and conducted in June-July 2020. Due to the international travel restrictions, the commissioning office decided this TE to be conducted as a home-based assignment without a field mission to Egypt and interviews with selected stakeholders to be performed remotely using a telecommuting modality.

Feedback from M&E activities used for adaptive management

The discussion under this section is based on observations whether the logical framework was used during implementation as a management and M&E tool and the extent to which follow-up actions, and/or adaptive management were taken in response to monitoring reports (APR/PIRs).

There was no information available to assess feedback from the project's own monitoring activities. Reportedly, there were travel restrictions in place during the instability period (2011-2013) that hindered normal conduct of internal project monitoring.

The Mid-Term Review (MTR) of the BSRD Project produced total 6 recommendations. Thematically, the recommendations focussed on quality assurance (No. 1), upscaling of project

activities (Nos. 2 and 3), a new activity originally not included in the project (No. 4), projects extension (No. 5) and revision of the project GHG reduction target (No. 6).

As a standard practice, MTRs usually include critical analysis of the project's results framework and eventually suggest modifications to the result indicators and/or their target values. In this particular case, no assessment of the quality and viability of the BSRD Project logical framework was conducted within MTR.

In order to ensure effective use of evaluation findings and recommendations and ensure that there are considered in follow-up actions, the MTR commissioning unit in cooperation with the Project Team should draft a management response to each MTR recommendation. The purpose of the management response is to decide how the Project Team and other stakeholders, as appropriate, will respond to the recommendations and detail key actions for implementation of the recommended change deadlines for their completion.

The management response was developed in May 2013. The recommendations together with proposed management response actions and their status are listed in Table 11 below.

Table 11: Summary of MTR recommendations and management response actions

Recommendation	Management Response	Status [11]
Recommendation 1: Work on safeguarding the quality of biogas installations should commence immediately	1.1 Develop complete construction manual. a. The manual will include standards, materials, accessories, warranty, performance and operation & maintenance. b. The manual will be translated into Arabic	I
	1.2 Recruit field engineers and masons. a. Four field engineers to be trained as trainers. b. Four masons to be trained as trainers.	I
	1.3 Adopt the standard of the construction of the biogas units and appliances with the context of the Egyptian Engineering Codes and standards. a. Formulate standardization of plant design, after sales service and quality protocols with cooperation of Engineering Faculties (Ain Shams Eng. Consulting Centre) b. Formulate standardization of biogas stove with cooperation of Ministry of Military Production.	I
Recommendation 2: With an outcome of increased biogas demand after the completion of the pilot biogas units, the Project should consider scale-up of biogas pilot installations that include cities beyond Shebin-el Kom, Asyut and Fayoum	2.1. Identify training and certification center for the masons and supervisors. a. Sign protocol with Training Centre for Building and Construction, Ministry of Housing for the ToT program. b. Assuring proper Biogas Mason and Biogas Supervisor training (both initial and refresher) and certification, whereby only plants constructed / supervised by certified manpower will be allowed for subsidy	I
	2.2. Announce Expression of interest for Biogas Construction Enterprise, followed by orientation workshops, and then request for proposals	I
	2.3. On the demand side, NGOs, Organization for Reconstruction and Development of the Egyptian Village (ORDEV) staff and RBOs in cooperation with PMU will provide campaign awareness in the targeted governorates and collect applications	I
Recommendation 3: If there is high demand for biogas units resulting from scaled-up activities from Recommendations 1 and 2, the Project will need to prepare financing packages that include possible buy-downs for the biogas units	3.1 Develop Socio-economic feasibility study	P
	3.2 Design the appropriate financing packages for rural households to access financing for a biogas unit and establish a simulating one under the name of Bioenergy Support Fund (BSF). a. Local Development Fund under ORDEV b. Social Fund Development (SFD) c. Environmental Protection Fund (EPF)	P
	3.3 Source other for the BESF. a. Develop NAMA concept paper b. Promote the NAMA with interest donors	N
Recommendation 4: Consider implementing a pilot to utilize waste straw that is often disposed of through opening burning	4.1 Use lessons learned from co-digestion and rice straw fermentation pilots and commercial units operating in China, India and Cambodia, and design appropriate pilot tests of similar units under Egyptian conditions a. Field visit to India b. Open dialogue with Sichuan Institute, and other entities in China, to see possibility of cooperation in new gasification technology.	N
Recommendation 5: The Project terminal date needs to be extended to June 30, 2015 to allow sufficient time to achieve its objectives	5.1 Request for extension will be sent to GEF	I
Recommendation 6: Reset the GHG emission reduction targets that reflect a realistic target for biogas unit installations by the proposed new terminal date of BSRD on December 31, 2015	6.1 Will depend on the actions described in the evaluation recommendation 3	N

The text of each MTR recommendation is complemented by a rather lengthy set of bullet points (not included in Table 8) that represent a mixture of specific conclusions and some details about the nature of required actions. The recommendations do not stipulate who should take responsibility for the proposed actions.

As a management response to the recommendations, the Project Team proposed 11 actions to address the recommendations No. 1-5. The 10 actions on recommendations No.1-4 were addressed to PMU, while the single action on recommendation No. 5 was addressed to UNDP. The management response did not propose any action on Recommendation No. 6 that called for revision of the project GHG reduction target.

[11] I- Implemented, P – Partially Implemented, N- Not Implemented

Recommendation No. 2 calls for upscaling the project activities beyond the initial three Governorates (Shebin-el Kom, Asyut and Fayoum). According to the explanatory bullet points under this recommendation in the MTR Report, the recommendation is based on "a forecast of higher demand for biogas units based on observed consumer reaction in Fayoum during the Evaluation Mission". This in was in fact an extrapolation of the high demand for biogas digesters based on observed results in just one Governorate out of the initial three. This is not considered sufficient justification for such upscaling, given the fact that the recommended action was not coupled with resources adjustment.

The approved Project Document estimated the target for the cumulative direct GHG emission reduction achieved by the bioenergy projects, whose implementation is directly facilitated by the BSRD project has been estimated at 192,000 tons of CO_2 over 20 years and the cumulative, GHG reduction potential including both direct and direct post-project GHG reduction at 2,3 million tons of CO_2 by assuming 20 % annual BET market growth after the end of the project. The same Project Document estimated that in order to reach the above target, over 63,000 household size, 3,800 community size and close to 70 farm size biogas plants as well as over 1,500 gasification plants would have to be installed during the 20 post-project years.

The target figures mentioned in the Project Document do not represent the BSRD Project target indicators but solely the replication potential of the project. Therefore, it is methodologically not correct to call for revision of the project potential targets since these are dependent on a number of parameters that are beyond control of the project implementation team.

The evaluator concludes that the managerial response to the operational recommendations No. 1-5 followed the standard practice for follow-up to M&E of UNDP/GEF projects. Nevertheless, as discussed above in the section 'Analysis of the project results framework', the indicators and target values in the projects' results framework contained several inconsistencies that hindered reporting on the project progress and the deficiencies were not addressed by MTR. A critical review of the project results framework at MTR would have been beneficial not only for post-MTR monitoring and reporting on the implementation progress but also for TE since incorrectly formulated indicators and/or their target values complicate evaluation of achievements of the project Outcomes and the Objective.

Although the M&E individual stages were implemented more or less correctly, the deficiencies in the use of M&E as a monitoring tool and insufficient feedback from MTR are basis for the rating of the quality of M&E implementation as **Moderately Satisfactory (MS).**

UNDP and implementing partner implementation / execution

The project followed the management arrangements presented in the Project Document that were based on a common scheme for project management arrangements under the UNDP National Implementation Modality (NIM).

EEAA as the designated Executing Agency for the project had duly fulfilled its role of the National Implementing Partner and had provided overall guidance and leadership for soliciting support of key officials at various levels of the Governments as well as raising the BSRD project profile in the country.

The UNDP Country Office had provided overall programmatic, administrative, and financial oversight of the project in accordance with the common UNDP procedures and tracking tools. The BSRD project management arrangements had been properly established and ensured full accountability for results and the use of GEF resources, while at the same time they had fostered national ownership of the Project and its alignment to national need and priorities. PMU under the auspices of PSC in close collaboration with UNDP CO had applied adaptive management approaches during the period 2011-2013 when the project was affected by the unstable political situation in the country.

There were three different UNDP Regional Technical Advisors (RTAs) over the course of the project that were actively engaged in the project. According to the practice in UNDP-implemented projects, RTAs provided technical policy, programming and implementation support, as well as backstopping to PMU and UNDP CO, and ensured thus proper oversight of the project implementation. The last two RTAs actively assisted in searching for solutions to the project implementation issues through their respective missions to Egypt in November 2015 and February 2018. Through extensive discussions with the Project Team and relevant stakeholders for the Government, the RTAs in cooperation with the Principal Technical Advisor based in UNDP Bureau for Policy and Programme Support (BPPS) engaged in efforts to find solution to implementation of the financial mechanism to support biodigester installations.

The last two UNDP RTAs were physically located in the UNDP Istanbul Regional Hub (IRH). This was due to restructuring of UNDP assistance network in order to optimize the support provided in the same thematic areas in multiple regions. However, the evaluator concluded that some support should have been provided from the UNDP Regional Service Centre for Africa in Addis Ababa as the geographical distance of IRH could have contributed to insufficient networking to other biogas initiatives and events organized by bilateral donors.

B**ased on the above findings, the overall quality of UNDP and implementing partners implementation/execution is rated Satisfactory (S).**

OVERALL RESULTS (ATTAINMENT OF OBJECTIVES)

The information presented in this section was sourced from the various project implementation reports and verified with information collected through interviews with key project informants. Additional sources of information were various technical and progress reports produced by the project, the Government agencies or other entities active in bioenergy for rural development in Egypt.

Relevance

The questions discussed under this section are to what extent is the project linked to the Egypt national development priorities and how is it in line with the GEF operational programmes and UNDP strategic priorities.

The BSRD Project is directly or indirectly linked to several Egypt national policy documents and action plans related to climate change and renewable energy.

The National Renewable Energy Strategy (2008) was adopted in order to achieve a generation of 20% of the country's electricity from renewable resources by 2022.

The Sustainable Development Strategy: Egypt's Vision 2030 (2015) aims to achieve a diversified, competitive and balanced economy within the framework of sustainable development. The document emphasises a central role of renewable energy will play for economic development.

The Integrated Sustainable Energy Strategy to 2035 (2015) is based on four strategic goals to ensure the technical and financial sustainability of the energy sector, while targeting energy diversification through renewable energy and a gradual subsidy phase-out plan.

Furthermore, the project is linked to the Egypt commitments under the United Nations Framework Convention on Climate Change (UNFCCC). Egypt ratified UNFCCC in 1994, the Kyoto Protocol in 2005, the Paris Agreement in 2017, and currently is in the national process for ratifying the Doha Amendment.

The BSRD Project is also aligned with the GEF strategies for climate change mitigation programming. The GEF Operational Strategy (1995) and Operational Programmes (developed from 1996 to 2000) that served as the basis for programming for GEF-1 and GEF-2 emphasized removing barriers to broader adoption of renewable energy technologies. The GEF-3 strategic priorities began to shift the focus upstream toward creating conducive policy and market environments for technology diffusion.

The GEF-3 Operational Program Number 6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs had the following objectives:

> *(a) remove the barriers to the use of commercial or near-commercial renewable energy technologies; and*
>
> *(b) reduce any additional implementation costs for renewable energy technologies that result from a lack of practical experience, initial low volume markets, or from the dispersed*

nature of applications, such that economically profitable "win- win" transactions and activities increase the deployment of renewable energy technologies.

Renewable energy has also been high amongst corporate priorities for UNDP. The UNDP Strategy Note on Sustainable Energy 2017-2021 defines actions to support governments in transforming their renewable energy markets—removing barriers to renewable energy investment and creating favourable conditions for private sector involvement. The UNDP Country Programme Document (CPD) for Egypt for the years 2013-2017 aimed at assisting the Government in reducing greenhouse gas emissions through initiatives to phase out ozone-depleting substances and in the fields of transport, biomass energy and other renewable energy technologies. This focus has been reiterated in the 2018-2022 CPD under which UNDP continues to help Egypt tackle climate change mitigation in tandem with pollution abatement, by promoting energy efficiency in cities and key economic sectors, and small-scale renewable energy technologies with poverty reduction dividends, encouraging a shift to low-emission technologies in industry.

In relation to the UN Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, energy is being recognized as a key enabler for development through establishment of the SDG Goal 7: *Ensure access to affordable, reliable, sustainable and modern energy for all.* The SDG targets relevant for the BSRD Project are Target 7.1 that calls to ensure universal access to affordable, reliable and modern energy services and Target 7.2 that prompts to substantially increase the share of renewable energy in the global energy mix. Universal access to energy, a higher share of renewable energy and massive improvements in energy efficiency are now part of the top global priorities for sustainable development. In addition to the direct relation to SDG 7, bioenergy is indirectly related to several other SDGs, such as those on food security, economic and industrial development, consumption and production patterns, and protection of ecosystems. SDGs relevant to bioenergy and their relevant targets are listed in Table 12 below.

Table 12: Relation of bioenergy to UN SDGs[12]

Sustainable Development Goals	SDG Targets Relevant to Bioenergy
Sustainable energy	
7. Ensure access to affordable, reliable, sustainable, and modern energy for all	7.1 Ensure universal access to affordable, reliable and modern energy services 7.2 Increase substantially the share of renewable energy in the global energy mix
Other SDGs:	
2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	2.3 Double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets
12. Ensure sustainable consumption and production patterns	12.4 Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
13. Take urgent action to combat climate change and its impacts	13.2 Integrate climate change measures into national policies, strategies and planning
15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustain- ably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	No individual targets

The BSRD Project is also relevant in relation to the UN Sustainable Energy for All Initiative that includes provision of modern cooking appliances and fuels as one of its 11 key action areas. A further international initiative, the Clean Cooking Alliance[13] is a public–private partnership that aims to create a global market for clean and efficient household cooking solutions.

Based on the above, relevance of the project is rated Relevant (R) for the recipient country, as well as the donor and implementing agencies.

Effectiveness & Efficiency

The principal questions to be discussed in this section are whether and how the project outcomes as well as its objective have been achieved and whether the project results have been delivered with the least costly resources possible. The further text will also highlight positive and negative, foreseen and unforeseen changes and effects produced by the project intervention.

In the series of tables below, the project results and achievements have been summarized and compared against the target indicators listed in the project's logical framework. The initial information about the project results/achievements was extracted from the project's PIRs and

[12] Compiled from Transforming Our World: the 2030 Agenda for Sustainable Development (UN, 2015), Indicators and a Monitoring Framework for the Sustainable Development Goals, Sustainable Development Solutions Network (SDSN)
[13] www.cleancookingalliance.org

verified and updated through interviews with the key stakeholders through the telecommuting modality. The interviewed stakeholders provided additional documents that were used for triangulation and verification of project rersults.

Tables 13 – 16 list the indicator targets for the individual outputs, summarize the delivery status at the Terminal Evaluation and provide rating for the Outputs' delivery. Each table contains an overview of the actually achieved project results in bullet points followed by a short narrative with additional insight and details on how and why the results have or have not been achieved. At the end, the narrative also explains the basis for rating of each project outcomes. The text following each table summarizes some important facts related to the project results that could not be captured in the tables but were considered important for the justification of the rating of the project outcomes.

Table 13: Deliverables for Outcome 1

Result	Indicators	End of Project Targets	Delivery Status at TE	Rating
OUTCOME 1: New business and financing models successfully introduced using appropriate technical solutions and demonstrating the possibility to construct and operate BET systems on a cost recovery basis under a supportive and enabling policy and financing environment	The level of confidence on modern BET and the implementation mechanisms promoted The operational and financial data of the systems installed The level of customer satisfaction	The first pilot bioenergy systems constructed and operated by professional "Bioenergy Service Providers" on the basis of maximum cost recovery At least 90% customer satisfaction on the new systems	Total 1,062 household and 118 community biogas units constructed and commissioned in 18 Governorates of Egypt (2013-2016) $50M^3$/day commercial biogas unit at a cattle farm in Fayoum (2015); $50M^3$/day commercial biogas unit at a cattle farm in Bahera (2015); More than 90% of the household/community units functional (as of 2016) Only 30 household units functional in evaluation survey of 239 installed units (2019)	S
Output 1.1: An updated market analysis and finalized plans and operational criteria for the project's capacity building and financial support strategy	Finalized, updated market analysis, plans and operational criteria for the project's capacity building and financial support strategy	Finalized, updated market analysis, plans and operational criteria for the project's capacity building and financial support strategy	Studies in 6 Governorates on household energy usage patterns and actual demand for biogas (2010) Technical specifications for tender documents on household and farm-level biogas units (2012) A procurement contract for 100 household biogas digester units in Asyut and Fayoum Governorates signed (June 2012) A procurement contract for 4 large-scale poultry farm units signed (July 2012)	S
Output 1.2: The Biomass Energy Support Fund (BESF) scheme successfully announced and launched	Number of applications received and approved	The applications for support to reach the first year targets, i.e. 50 family-scale biogas plants and 2 community-scale biogas plants received and approved	No deliverables	U
Output 1.3: The BET systems installed as per the project annual and final targets	Number of systems constructed	At least 1,000 family-scale, 10-20 community-scale, 2 farm-scale biogas systems and, 2 gasification systems (supported by the Government of Egypt) and 1-3 additional biomass combustion or, as applicable, gasification plants constructed and commissioned by the end of the project	Total 1,062 household and 118 community biogas units constructed and commissioned in 18 Governorates of Egypt (2013-2016) Commercial biogas unit at a cattle farm in Fayoum (2015) Commercial biogas unit at a cattle farm in Bahera (2015)	S
Output 1.4: A mid-term and final monitoring and evaluation report of the systems constructed	Reports finalized	The results compiled, analyzed and disseminated	Mid-term monitoring reports in the installation phase (2013-2016) Evaluation of a sample of installed biogas systems (2019)	S

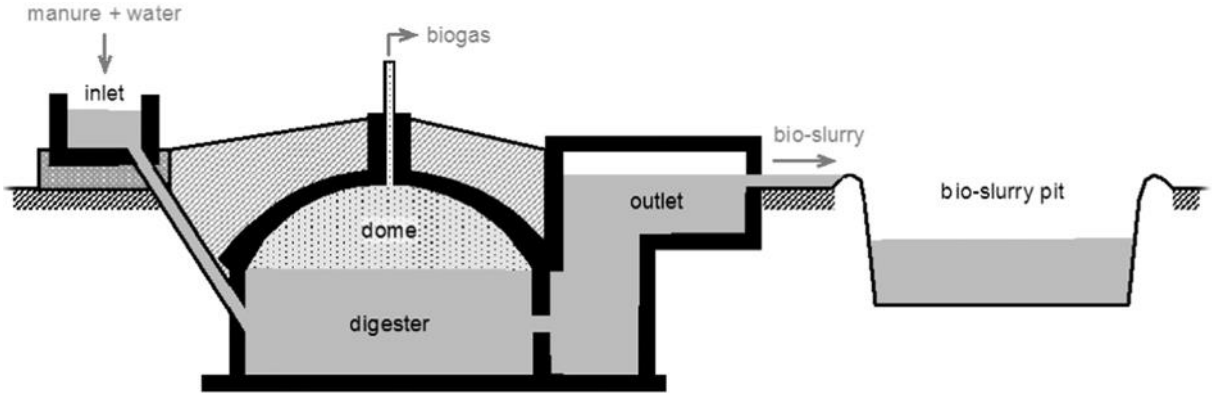
Output 1.1: In September 2010, the project conducted studies for marketing the biogas technology in 6 Governorates of Egypt. The studies carried-out technical, economic, and social assessment of the conditions for adopting biogas technology, contributed to better understanding of the household energy usage patterns and actual demand for biogas by rural households and assessed several locations with potential for pilot installation of household-scale biogas digesters. In the same year, a technical expert from Argentine visited Egypt and made assessment of the potential and usefulness of biogas technologies at a farm-scale. Another technical expert from India visited in 2011 and collected information necessary for tender document for the required biogas technologies. As a follow-up, a team of national consultants

visited the two Governorates (Fayoum and Asyut) and elaborated tender documents for procurement of 100 biogas household units and 4 large-scale poultry farm units. The tendering process was led by the UNDP Advisory Committee on Procurement (ACP).

In June 2012, the Project signed a contract with SKG Sangha, an international NGO from India, for supply of 100 small biodigester units for domestic use by rural families, with cattle dung as the main feed material. The biogas unit is a fixed dome model, using a design called the Deenbandhu design, which was adapted by the supplier for use in Egypt. The contract included provision of necessary technical assistance for installation of the biogas units.

The fixed dome digester design consists of an underground pit lined with either concrete or brick with an inlet pipe for adding feed to the digester. Gas is produced and stored under the dome at the top of the digester body. Biogas is transported from the digester by a pipe attached to the top of the dome. Bio-slurry is directed out from the digester into a storage chamber. The gas production depends on the size of the plant. The schematic representation is in Display 1 and technical features of the household biodigester units is summarized in Box 1 below.

Display 1: Schematic representation of a fixed-dome biogas digester[14]



Box 1: Technical parameters of the household biogas digesters procured by the project[15]

Parameter Name	Parameter Value
Biodigester unit type	Fixed dome
Hydraulic retention time (HRT)	60 days
Biodigester size	2, 3 4 and 6 m^3
Required fresh dung for daily feeding	50, 75, 100 and 150 kg
Required irrigation water for daily feeding	40, 60, 80 and 120 liters
Maximum gas storage	0.7, 1.0, 1.3 and 2.0 m^3
Burner type	Double burner with a stainless steel body
Burner capacity	450 litres/hour each
Operation of a single burner	1.5, 2.2, 3.0 and 4.4 hours

A second contract was signed with SKG Sangha for supply of 4 poultry farm biodigester units of the floating drum design with capacity to destroy 60% volatile solids and generate 0.4 m^3 of

[14]Tauseef S.M.,Premalatha M.,Abbasi T.,Abbasi S.A.: Methane capture from livestock manure, J.Environ.Manag.2013;117:187–207.
[15] Biogas Plant Users Manual, SKG Sangha, Kolar, Karnataka, India, 2013

biogas per kilogram of volatile solids destroyed. With 50 kilograms of mixed poultry dry manure, the site-specific and tailor-made units were expected to generate 10 m^3 biogas with >50% methane content.

Output 1.2: The Bioenergy Development Fund was not established.

Output 1.3: As of December 2016, total 1,072 household biogas units and 118 community level units were installed and commissioned for conversion of cattle dung into biogas for cooking and improved composting. The first batch of 100 household biogas units was installed by mid-2013 at households of small farmers in the Asyut and Fayum Governorates with 100% grants assistance, i.e. without cost-sharing by the beneficiaries. Moreover, SKG Sangha supplied also 2 experimental units.

Following the Decree from the Board of Governorates on biogas units' adoption (2014), a decision was taken to expand the project activities to additional Governorates for wider biogas technology dissemination. In this phase, the financial assistance by the project for further biogas unit installations was reduced to 60% of the total cost of the supplied units. The remaining 40% was requested from the farmers as a combination of in-cash (construction material purchase) and in-kind (construction work) contributions. The community biogas units were provided with the production capacity suitable to serve 2-3 families.

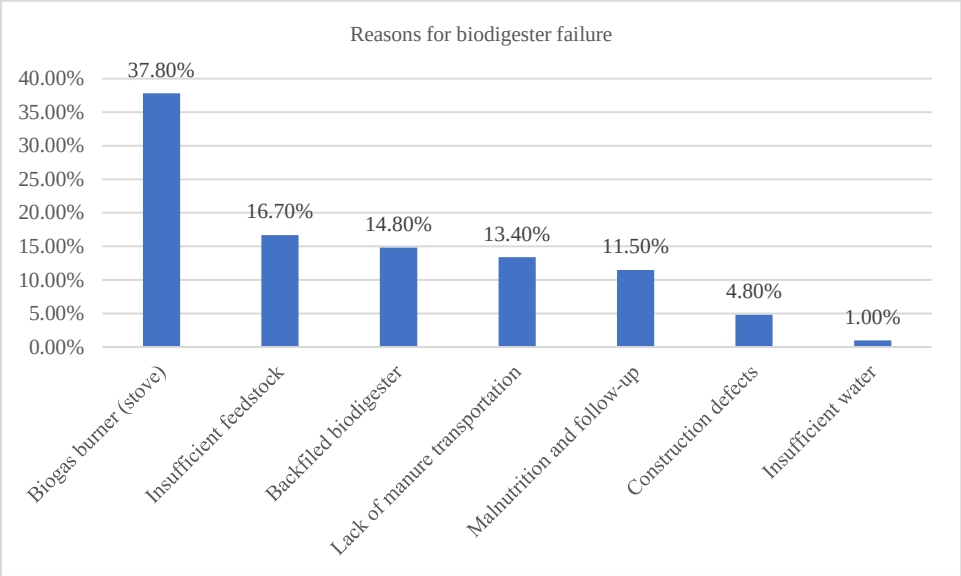
The decision to procure bio-digesters for poultry farms was changed after a visit of the project team accompanied by a UNDP Country Office to India in May 2013 for a combination of reasons. Firstly, it was found that India did not have sufficient experience and proven track record in the use of pure poultry litter as a bio-digestor feedstock that could be piloted and then demonstrated in Egypt. Secondly, it was established that the targeted poultry farms in Egypt required only lass than 5% of the energy that would be produced by the farm scale biogas units. Thirdly, as the poultry dung has a relatively low carbon/nitrogen ratio (about 9:1), the anaerobic digestion of poultry waste would produce significant amounts of toxic ammonia. To optimize the carbon/nitrogen ratio, the poultry droppings would have to be mixed with materials with higher carbon contents (e.g. food waste) to reach the optimum C/N ratio of about 20-30:1.

Consequently, the project terminated the second contract with SKG Sangha for the poultry farm units and changed to large-size biogas units for treatment of animal waste with higher carbon contents. As cattle manure has higher C/N content, the project procured two 50m^3/day industrial scale biogas units of German design for two cattle farms in Fayoum and Behera.

Output 1.4: The project trained a number of Bioenergy Service Providers (BSPs) to provide assistance with construction of the biogas units and render post-construction service. The contracts with BSPs included not only construction of the units but also one year of monitoring functionality of the units. BSPs were thus responsible to provide the project with a satisfactory certificate filled and signed by the beneficiary every three months. In order to double check the BSP reporting, the PMU staff visited randomly selected units and made phone calls to the beneficiary households to find out about their satisfaction with the biogas units and related services provided by BSPs. Annual GEF PIRs produced in 2013-2016 claimed that monitoring results compiled in this period showed more than 90% satisfaction of the end users.

In 2019, the Bioenergy Association commenced a comprehensive report titled *"Logical Framework for Household Biogas Units in Rural Egypt"*. The report contained results of surveys for evaluation of a sample of 239 fixed dome biogas units that had been installed in the Upper Egypt and Nile Delta regions. Out of the 239 biogas units evaluated, only 30 units were found fully operational while the remaining 209 units stopped operation due to various technical and operational challenges. The result of this analysis is on Display 2 below.

Display 2: Main reasons for biodigester failure



Non-functional biogas stove (burner) was the most frequently cited reason for stopping the biodigesters' operation (in 37.8% cases) while construction defects were found responsible only for 4.8% cases of discontinued operations. Various operational issues were responsible of more than 40% of non-operational biodigesters.

Overall Assessment of Outcome 1: Although the project slightly exceeded the target for installation of the household biogas units, the recently conducted evaluations found only a relatively low fraction of the installed units in sustained operation. The fact that problems with the cooking stove were cited as the prevailing reason for discontinued operation might suggest that insufficient attention had been paid to provision of burners suitable for the biogas technology. Reportedly, the project concluded a contract with one of the biggest private Egyptian factories for supply of specifically designed burners suitable for biogas. There is no information on how many such special burners had been supplied to the end users under this project. However, the 2019 BSDA report suggests that farmers usually prefer normal burners suitable for LPG as a cheaper choice over the special burners for biogas and that many installations did not apply a filter after the biogas outlet for removal of hydrogen sulphide gas that causes corrosion of burners.

While the post-installation monitoring reports showed more than 90% client satisfaction in 1-2 years after commissioning of the units, the evaluation surveys conducted after a longer time interval on a sample of installed units found only about 12.5% units functional. These findings

suggest that the project has succeeded in demonstration of the fixed dome biodigesters for rural households but could not ensure sustained use of the technology.

As for financing of the installation, the project was expected to follow a two-staged approach to provide grants from the project as a capital subsidy for initial 50 units and facilitate establishment of new, end user lending schemes in the second phase with the help of BDF as the financial arm of the project. In reality, the two-staged concept was not implemented and all biodigester units had been installed using the project funds as partial subsidies with variable cost-sharing (mostly in-kind) by the end users. Moreover, the decision to expand the technology demonstration to multiple Governorates with different agricultural profiles caused spending the project resources thinly across large geographical areas.

Based on the above, the achievement of Outcome 1 is rated Satisfactory (S).

Table 14: Deliverables for Outcome 2

Result	Indicator	End of Project Targets	Delivery Status at TE	Rating
OUTCOME 2: An enabling policy framework, effectively promoting rural bioenergy development adopted	The content of the policy actions, legal and regulatory changes adopted	An enabling policy framework for promoting sustainable rural biomass energy adopted, including: • Recognition of the BET and other renewable systems in official Government documents as the first option to be studied and considered for meeting rural energy needs, whenever technically and economically feasible • A level playing field for BET systems to compete with subsidized fossil fuels created and, as applicable, introduction of eventual additional financial or fiscal incentives to support BETs on the basis of their socio-economic and environmental benefits; • A supportive regulatory framework for managing the relations between the bioenergy service providers and the customers; • Adoption of adequate product standards and quality control mechanisms	Consultancy Group for Sustainable Energy (2013) Bioenergy resources recognized in the 2035 Integrated Sustainable Energy Strategy (2019) Coupon system for butane gas cylinders introduced (2014) Feed-in-tariff for electricity generated from renewable energy sources (2015) Feed-In-tariff for electricity generation from municipal waste and biogas (2019)	MS
Output 2.1: Enhanced awareness of and established policy dialogue with the key stakeholders and decision makers on the socio-economic benefits of BET systems	The PR material produced. The list and output of consultations held	A project presentation package finalized Initial meetings and consultations with the key stakeholders and decision makers finalized within the first 6 months of the project. Enhanced awareness of the general public through programs and articles in public media, workshops etc.	Awareness raising events through SGP (2012-2014) A Decree from The Board of Governorates on biogas units' adoption (2014)	S
Output 2.2: A draft policy paper highlighting the barriers and recommending improvements for the current policy framework for the promotion of rural bioenergy systems	The status of the document	The draft policy paper finalized	No deliverable	U
Output 2.3: Continuing consultations, promotional events, high-level meetings and other measures to facilitate the adoption of the recommendations made	The status and level of policy dialogue	The required measures to facilitate the adoption of the recommended improvement of the BET policy environment finalized	No deliverable	U

Output 2.1: Through members of PSC and the representatives of the Ministry of Petroleum, Ministry of Electricity and Ministry of International Cooperation, the project established the Consultancy Group for Sustainable Energy. The Group's main role was to present policy statements to the Cabinet and the Supreme Council of Energy to be integrated into Government Programmes and yearly plans.

The project elaborated on the formal correspondence with Governors of the target Governorates and organized an introductory meeting for the Heads of Centers and Villages to inform them about the project, its activities, importance of the biogas units and how to reach the companies. In order to support the awareness raising activities, the project provided number of informative posters and brochures to put on governmental buildings to attract attention of local citizens.

The GEF Small Grant Program (SGP) was used as a vehicle for awareness raising about the benefits of biogas use in rural communities and organized a number of outreach events that reached almost 2,000 farmers in 2012-2015.

Output 2.2: No policy paper was prepared.

Output 2.3: This output was linked to the previous one hence the project proposed no recommendations nor measures to facilitate adoption of the required policy framework.

Overall Assessment of Outcome 2: The policy component of the project was poorly designed as there are no direct causal relationships between the outcome and its composite outputs. The Project Document highlighted the need for enabling policy to provide a level playing field for BETs and made the establishment and adoption of such policy framework one of the key project targets. Although Output 2.2 called for preparation of a policy paper to identify barriers and provide recommendations for improvements for adoption of the bioenergy policy framework, the paper alone would not ensure adoption of the policy framework supportive to bioenergy/biogas utilisation. A more appropriate assistance by the project in this field would have been support in the process of formulation and approval of the policy and regulatory frameworks.

Therefore, the only tangible result of the project's policy component was some level of awareness about the biogas technology in rural households and small farms. However, the exact level could not be quantified due to insufficient formulation of the output indicators and targets. The project induced limited policy support in the form of the 2014 Decree by the Board of Governorates that called for adoption of the biogas technology beyond the originally proposed 4-5 Governorates. Although the Decree provided some sort of policy support, it was an *ad-hoc* rather than systematic policy measure.

In 2011, the Government of Egypt announced its plan to trim subsidies on LPG gas based on a coupon system for sales of LPG cylinders and provide thus policy support for wider adoption of bioenergy. Implementation of the plan was delayed because of the political turmoil in 2011-2013 and the initiative was launched only in 2014. According to the new policy, a family of 4 was entitled for only one LPG cylinder per month at the subsidised price of EGP 10 (US$1.38) while additional cylinders for the same family would be unsubsidised. The project did not play any role in development of this policy initiative. Nevertheless, the partial removal of energy subsidies provided some indirect incentives for using biogas, especially in rural areas.

In 2015, a feed-in-tariff (FiT) for the renewables was proposed at the level of EGP 0.92/kWh, (equivalent of 0.11 US$/kWh)[16] as a new financial mechanism to promote renewable energy

[16] Decision of the Council of Ministers number 5/10/15/4 dated 28 October 2015

technologies. The proposed FiT included also combined heat and power (CHP) plants based on biogas. However, the tariff did not have any relation to biogas use at the rural household level as it favorized larger biogas CHP plants given the potential revenues and the number of households potentially supplied[17].

The Bioenergy Association was to some extent involved in discussions for formulation of a specific FiT for biogas that was proclaimed in 2019 at the level of EGP 1.40/kWh[18]. This process included comprehensive consultations between all the relevant stakeholders, namely Ministry of Environment, Ministry of Electricity, Ministry of Housing, Utilities and Urban Communities, and Ministry of Local Development. BASD was designated to serve as a secretariat to a National Technical Committee (NTC) chaired by the Ministry of Environment for FiT implementation.

The proclamation of FiTs together with gradual reduction of the fuel subsidies was an important step in the development of the country's significant potential for biogas use, while pursuing equally important economic, environmental and social policy objectives. However, the project did not succeed to trigger sufficient action at the national level towards establishment of a systematic policy framework and provision of financial incentives in favour of BETs.

In particular, no institutional mechanism was established in Egypt that would create a common background and mobilize a variety of relevant stakeholders for adoption, diffusion and upscaling of the biogas technology. Absence of policy and regulatory frameworks combined with lack of financial incentives were the reasons that the project did not move from the biogas technology demonstration and establishment of basic element of the market with biogas technologies towards more advanced stages of the market.

Based on the above, the achievement of Outcome 2 is rated Moderately Unsatisfactory (MU).

[17] Bioenergy and Food Security Assessment for Egypt: Sustainable bioenergy options from crop and livestock residues, FAO, 2017
[18] Decree of the Cabinet of Ministers No. 41/2019 2 December 2019

Table 15: Deliverables for Outcome 3

Result	Indicator	End of Project Targets	Output Delivery Status at TE	Rating
OUTCOME 3: Enhanced capacity of the local supply chain to market and deliver sustainable rural bioenergy products and services, including financing	The number of identified and trained "Bioenergy Service Providers" (BSPs) capacitated to continue to operate on a self-sustaining basis after the end of the project The level of follow-up activities of the trained BSPs	The capacity of at least 20 local entities to serve as BSPs built The follow-up activities and business of the trained BSPs show an increasing trend, leveraging financing from a variety of sources	20 registered Bioenergy Service Providers (2015)	S
Output 3.1: An updated survey and evaluation of the existing (or potential future) market players and their capacity to produce rural biomass energy related products and services	The status of the survey	An updated survey and capacity evaluation finalized	Survey by SKG Singha (2012) 12 potential BSP companies identified through a tendering process (2013)	S
Output 3.2: Channels and opportunities for information exchange, networking, match making missions and conditions for different local and foreign entities to explore opportunities for co-operation created	Number of contacts facilitated	Project web site established including links to relevant information At least one international, bioenergy workshop in Egypt and 5-10 matchmaking missions facilitated by the project	Project website (**www.egyptbiomass.com**) Link to the project from EEAA website http://www.eeaa.gov.eg/en-us/mediacenter/reports/projectstudies/biomass.aspx 18 seminars, workshops and awareness meetings in 13 Governorates (2012-2016) Webpage of BASD http://www.bio-egypt.org	MS
Output 3.3: A manual for the development and financing of rural bioenergy projects in Egypt	The status of manual	Finalized manual in Arabic and in English for developing and financing of rural bioenergy projects in Egypt	Biogas Plant Construction Manual (2013) Biogas Plant Users' Manual (2013) Biogas Education Manual (2014)	MS
Output 3.4: An information and marketing package tailored for the targeted co-financing sources to support the BSPs and related awareness raising / match making finalized	The availability of the information and marketing package. The number of meeting and financial matchmaking events organized	Information and marketing package about BET systems to potential financing institutions finalized Contacts created between the BSPs and with at least 5 new promising co-financing sources in addition to the SFD	Proposal for establishment of a Bioenergy Fund (2015)	MS
Output 3.5: Draft technical standards and certification system (to be adopted either as a voluntary or as a mandatory quality control scheme – see outcome 2).	The status of the technical standards/ requirements and a certification system.	Technical standards or requirements and a certification system developed and adopted (see outcome 2) both for hardware and for service providers in the distribution chain	Cooperation protocol with the Faculty of Engineering, Ein Shams University (2013) BASD cooperation with EOS on development of standards (2019)	MS
Output 3.6: Trained and, as applicable, certified product and service providers, including manufacturers, technicians etc.	Number and type of people trained Verified results of the training through a certification scheme	At least 100 people trained and, as applicable, certified from the supply chain in order to build up their technical, management and marketing, plant operation and maintenance and/or financial engineering skills (the scope of training depending on the target group)	Initial train-the-trainers programme (2013) 4 on-the-job-training programmes (December 2013- April 2014) Training programmes in 5 Governorates (2014 - 2015)	S
Output 3.7: A joint public awareness raising and marketing campaign with supply side product or service providers for the targeted customers	The number of Letters of Interest (LoI) received	The number of LoIs received correspond to the targeted amount investments	Cooperation protocol with the Organization for Reconstruction and Development of the Egyptian Village (2013) Agreement with the Training Centre for Building and Construction (2014)	

Output 3.1: In 2012, in preparation for the contract for supply of household biogas units, the project conducted considerable survey work and community outreach to obtain more data on potential users of biogas digesters. Through publishing a request for expression of interest in the newspapers, the project identified the intial set of 12 companies that expressed their interest in working on bio-digester unit installations and after-sales services. A number of individuals that worked closely with the project during the first batch of unit installations registered their private companies and started working in the same field after receiving practical training. At that stage, about 30 BSP companies were officially registered. Moreover, the project assisted about 15 of established NGOs to successfully apply for GEF-SGP grants to engage in awareness raising in the rural communities. As an example, work of the National Council for Women (NCW) could be mentioned. NCW engaged in awareness raising campaigns all over the country and helped to collect applications for biogas digester installations from rural households.

Output 3.2: The project established a website but it was not possible for TE to review the website as it was not functional at TE. The Media Centre of the EEAA website provides a link to the BSRD project studies but it leads only to reports from the initial set of studies conducted in 2010 on household energy usage patterns and actual demand for biogas.

Following its official registration, BASD established its own webpage that contains basic information about BETs, the services provided by BASD, its current projects and future goals. However, the website does not offer any knowledge products from the project (such as the biogas construction manuals or technical assessment reports).

Output 3.3: To support construction of the fixed-dome biogas digesters, SGK Singha prepared three manuals to provide biogas household users, construction workers and rural communities with information on the biogas technology. The manuals were supposed to be translated to Arabic but there is no information in the progress reports that this had actually happened. The manuals were found at the SGK Singha website but the latter does not provide any information on how the manuals were used in the project implementation.

Output 3.4: The project focused considerable effort to developing a proposal for the Bioenergy Development Fund. This work included drafting of the Fund charter and operational guidelines, outlining procedures for loan and buy-down approval, loan evaluation, a system of borrower evaluation, a loan approval decision-making process, loan and buy-down contracts, and monitoring modalities. To some extent, possible sources of financing for BDF were explored, including the Government funds from reduced fossil fuel subsidies and climate finance, and the project could usefully explore Nationally Appropriate Mitigation Action (NAMA) possibilities for the Fund. As discussed in the section ‘Efficiency’, BDF was never established under this project.

Output 3.5: In October 2013, the project signed a cooperation protocol with the Faculty of Engineering, Ein Shams University. The Faculty was expected to design a quality control mechanism and apply it on a pilot basis to the first batch of 100 biodigester units. The Faculty was also required to help with inclusion of the household biodigester design in the Egyptian Code of Construction and work as an independent quality control for the installed biodigester units.

Under this contract, the Faculty assisted to develop a regulatory framework for the registration process of BSPs that consisted of specific selection criteria for engineers and masons, on-job training supported by an approved training manual, and BSP certification by the Ministry of Environment and the Faculty of Engineering.

In order to ensure the quality control for biodigester installations, the project entered negotiation with the Egyptian Organization for Standardization (EOS) to develop standards and specifications for the locally manufactured or imported BETs. Although this effort started as early as 2012, no results were reported in the period of the construction phase (until 2016).

After its establishment in 2019, BASD set a target in its work plan to develop a code of biogas technologies through cooperation with the Egyptian Organization for Standardization (EOS) and the New and Renewable Energy Authority (NREA). To ensure adequate product standards and quality control, a national consultant was assigned to provide assistance with drafting a national code for biogas technologies based on the international standards and for registration of BSPs. No information was available on the status and eventual results of this work.

Output 3.6: As part of the contract for construction and commissioning the first batch of household biogas units in the Fayoum and Asyut Governorates (Output 1.3), the supplier (SKG Sangha) trained the first group of 4 engineers and 4 professional masons to conduct the installations. As the demand for biogas digester installations was boosted by the 2014 Decree of the Board of Governors to increase the number of installations beyond the initially selected Governorates, it became evident that the demand for biodigester units was higher than the available trained staff. After testing the first installed units and ascertaining their functionality, the supplier, in collaboration with the project, organized on-the-job training programmes on building, commissioning and maintaining the household biogas units.

The trainings took place in 4 batches as follows: December 2013 (Fayoum), January 2014 (Asyut), April 2014 (Fayoum), and April 2014 (Asyut). The trainers of the first and second batches were the project's initial trained engineers and masons under the supervision of the expert from the supplier, while the trainers of the third and the fourth batches were the graduates of the first and second batches under the supervision of the project's core trainers. These training programmes resulted in 8 engineers and 8 masons in trained in Asyut and 9 engineers and 9 masons trained in Fayoum. Later in the year further training programmes were organized in Fayoum, Asyut, Sharkeya, Beni Sweif and Menya Governorates with participation of 7 engineers and 7 masons.

The training programmes targeted 30 groups each consisting of one engineer and one mason. After the trainings, the groups were requested to officially register in order to legally operate as Bioenergy Service Providers. However, only 20 BSPs successfully completed the registration and started their work on bio-digester unit installations and post-installation customer support services in different Governorates. The rural households demanded such services either following the project awareness campaigns or application collection by the EEAA Regional Branch Offices (RBOs). The payments to BSPs was contingent on provision of satisfactory post-installation service for one year. This proved that the post-installation support was considered equally important part of the scheme as just the installation of the biodigester units.

After completion of the BSRD Project activities on biodigester installations, opportunities for the BSP companies to provide construction services and maintenance for biodigester units gradually faded out. At TE, there were 18 officially registered BSPs, however, some of them had to reorient to other areas due to lack of business opportunities related to biogas installations.

Output 3.7: In 2013, the project signed a cooperation protocol with the Organization for Reconstruction and Development of the Egyptian Village under the Ministry of Local Development. In the same year, the project signed an agreement with the Training Centre for Building and Construction (TCBC) under the Ministry of Housing with 62 branches all over Egypt for provision of professional and certified training for masons on how to construct household biogas units.

Overall assessment of Outcome 3: The BSRD Project has succeeded in establishing a pool of trained masons and engineers for provision of technical assistance and service for construction, commissioning and post-installation maintenance and facilitating official registration of BSPs as local microenterprises. However, this was not sufficient for establishment of a robust and sustainable supply side of the biogas market as the capacity building efforts were not complemented by suitable financial mechanism that would enable BSPs to operate in the early stage of biogas market creation.

Viability of BSP businesses depends on the demand side of the market that in turn depends on available financing. Lack of upscaling after the successful installation of the project target of 1,000 biodigesters and no available concessional financing for construction and maintenance were the reasons that some trained individuals or even entire BSPs had to divert to other activities where they could generate sufficient earnings. Few BSPs engaged in construction of larger biodigester units for production of bio-slurry with an objective of selling the latter on the market as bio-fertilizer.

The ambitious effort to expand the biodigester installation to total 18 instead of the originally proposed 4-5 Governorates was in fact an attempt to upscale the biogas technology at the time when the demonstration of the technological model had still been a work in progress and the demonstration of sustainable financial models had not even started. It is supposed that due to the expansion to wider geographical areas it resulted in less than optimal after-installation and maintenance services.

The capacity building of BSPs focused mainly on technical aspects of construction and maintenance of biodigesters but did not pay sufficient attention to other facets, particularly those that affect financial attractiveness of the investment into the biodigesters such as use of the bio-slurry as a substitute for synthetic fertilizers. There were no reported linkages of the project to agriculture extension service that is in the best position to provide expert advice in this regard and also, due to the relatively dense network of agriculture extension officers, serve as points of interaction with farmers even in remote rural areas.

Based on the above findings, the overall achievement of Outcome 3 is rated Satisfactory (S).

Table 16: Deliverables for Outcome 4

Result	Indicator	End of Project Targets	Delivery Status at TE	Rating
OUTCOME 4: Institutionalization of the support provided by the project	The level of support available at and after the completion of the project	Continuing promotion of bioenergy activities in Egypt after the end of the project on a self-sustaining basis	Bioenergy Association activities Cooperation with academic institutions	MS
Output 4.1: Including rural biomass energy increasingly into the curricula of the relevant academic and other educational institutions	The level of inclusion of bioenergy into the relevant curricula	Rural biomass energy increasingly included into the curricula of the relevant academic and other educational institutions	Cooperation protocol with the Faculty of Engineering, Ein Shams University (2013) Cooperation protocol with the Faculty of Agriculture, Menya University (2014)	S
Output 4.2: A Biomass Energy Association or another applicable entity continues to serve as a focal point for further promotional activities on a self-sustaining basis	The existence and continuing effective operation of a bioenergy focal point after the project	A rural bioenergy focal point established and continue its effective operation also after the project	Biomass for Sustainable Rural Development Association (2015)	MS
Output 4.3: As needed, further elaboration and financing leveraged for applicable financial support mechanisms to continue the promotion of bioenergy	The continuing availability of the required financial support, when needed	Adequate financial support mechanisms established and continue to operate after the end of the project	Soft loan financial mechanism proposed (2016) Performance Based Payment mechanism proposed (2017) Memorandum of Understanding for financing biogas units (2019)	MU
Output 4.4: Final project report and the associated promotional material and events	The report and the related promotional material and events completed	The report and the related promotional material and events completed		U

Output 4.1: In 2013**,** the project signed a cooperation protocol with the Faculty of Engineering, Ein Shams University, on October 29, 2013, to provide technical assistance and spread biogas technology among faculty students. The Faculty agreed to assist in integrating the household biogas digester units promoted by the project in the Egyptian Code of Construction and to work as a third-party quality control for implemented units. The cooperation also contained awareness raising component about the technology among students through an elective course on biogas and awareness meetings on the Faculty campus.

Similarly, the project signed a cooperation protocol with the Faculty of Agriculture, Minya University, on August 30, 2014, to provide technical assistance and spread biogas technology among faculty students. The Faculty agreed to assist the project in analysing bio-fertilizer and provide recommendations on the best ways of using it in cultivation of crops.

Output 4.2: In June 2015, the Ministerial Cabinet approved establishment of the Bioenergy Association for Sustainable Development (BASD) as a central non-profit entity in accordance with the Egyptian law[19]. The Association is managed by the Board of Trustees composed of judicial persons representing concerned ministries and other relevant authorities chaired by the Minister of the Environment. BASD has wider scope of work as it covers biogas digesters of all sizes (household-medium-large), bio-organic fuel technologies as well as organic waste

[19] Decision of the Prime Minister No. 12/15/07/52 Dated 08 July 2015.

recycling technologies. The Association aims at connecting to leading businesses for job creation in order to contribute with value-added benefits to the national economy while taking into consideration environmental and social perspectives.

Although BASD was officially registered in 2015, it actually became operational only in 2019. Its workplan includes preparation of feasibility studies for large-scale biogas units that are in high demand in large cow farms, ago-food companies and sewage treatment plants.

Since the end of 2019, BASD has been party to a joint initiative of the National Bank of Kuwait-Egypt (NBK-Egypt) and the International Labour Organization (ILO) for establishment of 60 household biogas units in villages of the Minya Governorate. MOU was signed by the three parties in November 2019, as a as follow-up to the project that had been launched by NBK-Egypt/ILO and the Government of Canada in 2018 for construction of 100 biogas units in Minya. Under the follow-up initiative, BASD oversees implementation of the technical and awareness raising components.

Output 4.3: In the Project Document, 1.2 million USD were set aside for a guarantee/loan mechanism to be transferred to a third party. It was envisaged to put this mechanism in place early on in the project and monitor its operation for several years. However, it turned out that the proposed mechanism was not in line with the UNDP financial rules and regulations.

UNDP-GEF worked with UNDP-OFRM (Office of Financial Resources Management) to find a solution. In the meantime, the project considered provision of soft loans at 6% annual percentage rate (APR) and maximum loan duration up to 5 years with a grace period of up to 6 months. The loans would be provided by a cooperating commercial bank while the project funds would be used as a guarantee for leveraging additional resources from the financial market. The loan was proposed to cover 70% of the total cost of a biodigester unit while 20% would be granted from the project funds and the remaining 10 % would be required as in-cash contribution by the beneficiary. The loan would be offered through BSPs to apply for a larger loan that would enable them to provide credits to several clients. However, the mechanism would have to include coverage of the risks for BSPs by special arrangements with risk sharing by the BSPs. This mechanism was never applied due to lack of interest by commercial banks.

Another option considered was a Performance Based Payment (PBP) mechanism for low value payments. A third party, in this case the Social Fund for Development (SFD), would administer funding for biodigester units through the Biomass Service Providers. This mechanism would require BSPs to provide upfront financing for the biodigesters and claim reimbursement only after completion of an installation and verification of its functionality. The PBP modality was approved by the UNDP OPG and guidance for its use is available in the UNDP POPP.

Launching of the PBP mechanism for financing under the project was delayed as the SFD proposed to host the financial mechanism ceased to exist and was replaced by the Medium, Small and Micro Enterprises Development Agency (MSMEDA)[20]. In March 2019, a Memorandum of Understanding (MoU) was signed between MSMEDA, BASD and EEAA.

[20] MSMEDA was established by Decree of the Prime Minister No. 947 of 2017 and amended by the Decree No. 2370 of 2018

Further to the approval of MoU by the BASD Board of Trustees in April 2019, the Ministry of Environment transferred 5 million EGP to MSMEDA as an advance payment for capitalization of this mechanism. Since the start of this mechanism, MSMEDA approved only 2 applications (one from an NGO and one from a BSP company) and rejected about 8 other applications on grounds of negative commercial evaluation of the applicants.

The failure to launch BDF as the project financial vehicle was one of the reasons that the project did not attract any external finances from commercial and semi-commercial banks and could not attract micro-finance institutions (MFIs) to participate in the project.

Output 4.4: No final Project Report was available at TE.

Overall Assessment of Outcome 4: The most important result of this project component is establishment of the Bioenergy Association that took over from the project-bound PMU in order to oversee further development of the bioenergy sector in Egypt.

Equally important, although less tangible, are the results of the project's partnership with the universities in two Governorates, through which the project stimulated elaboration of special courses on BET and their inclusion in higher education curricula. This collaboration also initiated the work on preparation of quality standards for the rural biogas programmes Moreover, the project catalysed development of a biogas laboratory in the Agriculture Department of the Menoufia University in order to advance the research work on utilization of bio-slurry in crops cultivation.

However, the project did not succeed to establish and demonstrate a functional financial support mechanism therefore did not help to remove the financial barrier to post-project uptake of the household biodigester units and their upscaling.

Based on the above findings, the overall achievement of the Outcome 4 is rated Moderately Satisfactory (MS).

Achievement of the Project Objective

Status of achievement of the Objective is summarized in Table 17 below.

Table 17: Status of achievement of the project objective

PROJECT OBJECTIVE			
Indicator	**End of Project Targets**	**Delivery Status at TE**	**Rating**
The level of confidence on modern BET as means to contribute to rural energy needs. The market growth of BET The level of supportive framework conditions in place sustaining the market growth after the end of the GEF project	High level of confidence Average 20% market growth at the end of the project Supportive policy, including required financial and fiscal incentives in place to sustain the market growth	90% confidence in the initial stages of the project 13.6% biodigester units functional (2019) No information available about status of the BET market Feed-In-tariff for electricity generation from municipal waste and biogas (2019)	MS

As discussed in the previous section, the project has achieved a majority of its planned results. However, the status of the project targets at the Objective level shows the achievements at the Outcome did not fully materialize the level the Project Objective.

The underlying premise of the BSRD Project was that technology diffusion is driven by user satisfaction and product credibility. The level of confidence of the end users was continuously monitored during the construction phase of the project (until 2016) and reportedly more than 90% of the installed biodigester units had been functional at that time. However, a recently conducted technical evaluation of fixed dome biogas units in some Egyptian Governorates found only 13.6% of the evaluated units functional[21]. These figures prove that the initially high level of confidence in BET has not been sustained in longer term.

To create a new market, coordinated effort is needed to build supply, demand, and an enabling policy environment. The biogas market in Egypt is still in its nascent phase and has largely been patronized by external implementation programmes. Although there is no quantitative information on the status of the BET market in Egypt, there is no doubt that the rural biogas applications hold only a very small share of the BET market.

For development of the specific biogas market, the Government was expected to provide policy, legal, financial and institutional frameworks while NGOs and private sector players would act as implementing agents. At the project inception, Egypt did not have any policy supporting biogas applications. There were two relevant supportive policies adopted during the project implementation, namely phasing out energy subsidies and adoption of a FiT for electricity generation from municipal waste and biogas.

The phasing-out of energy subsidies was originally planned for launching in 2011 but was delayed as a result of the political instability in 2011-2013. It was finally introduced in 2014 as part of a comprehensive economic reform programme to restore macroeconomic stability and promote inclusive growth. However, the devaluation of Egyptian currency in 2016 and subsequent cost increase of imported commodities reduced the effect of the initial phasing out of subsidies.

FiT for electricity generation from municipal waste and biogas was pronounced in 2019. The biogas sector is mostly driven by larger applications that sell the produced electricity to the electricity utility and distribution companies and surely will be boosted by the adoption of FiT. However, this FiT has no impact on uptake and diffusion of the small biodigester units in rural households that are subject of this project.

The project has established a network of actors for development of BETs based on the core of the network formed by EEAA as the national Executing Agency for the project. The network included relevant public agencies with mandates in the energy and environment fields. As the project progressed, the network was extended with actors that facilitated outreach to the village level (such as ORDEV and TCBC).

Although the project target for reduction in GHG emissions is not listed in the project results framework, the approved Project Document estimated the cumulative direct GHG emission reduction from bioenergy installations directly implemented under the BSRD Project at the level of 192,000 tonnes of CO2 over a 20-year calculation period. Comparison of the direct

[21] Data cited in the report commissioned by BASD, the original source report on the evaluation phase of household biogas units in rural Egypt was not available.

GHG reduction estimated at the project inception against actually achieved reductions is provided in Table 18 below.

Table 18: Comparison of direct GHG emission reduction estimates induced by the project[22]

	E.R. per installation (tCO_2/a)	Number of Installations		Emission Reduction (tCO_2/a)	
		Planned	Actual	Planned	Actual
Biogas - household unit	1.6	1,000	1,062	1,600	1,699
Biogas - community unit	13.5	10	18	135	243
Biogas - farm unit	58.6	2	2	117	117
Biomass gasification MW	1,940	4	0	7,760	0
Total (tCO_2/a)				**9,612**	**2,059**
Total ($tCO_2/20a$)				**192,244**	**41,188**

It follows from Table 18 that a major part of the planned GHG emission reduction was expected to come from biomass gasification plants. However, the biomass gasification component was abandoned at the inception of the project and therefore not pursued.

The total actually achieved emission reductions for biogas units are estimated at 2,059 tCO_2/a. The figure for cumulative emission reductions in 20 years is only theoretical as it would assume functionality of all installed biogas units over the 20-year period. The evaluation conducted in 2019 on a sample of 239 household units found only 13.2 % of the units functional after 3-7 years since their commissioning.

At the same time, the estimated cumulative CO_2 reduction (direct, direct post-project and indirect) from the expected market development facilitated by the BSRD Project was estimated at 2.3 million tonnes of CO_2 by 2025. There has been only limited upscaling through the recent ILO/NBK biogas initiative that is expected to install 160 household biogas units. Certainly, there has not been any BET market growth induced by the project.

The short comparison of planned and actual GHG emission reductions shows that the calculations of the GHG emission reductions at the project preparatory stage were grossly overestimated. Apart from the cancellation of the biomass gasification component also the expected emissions from the biogas units were miscalculated as the projections did not take into consideration that not all biodigester units would remain operational for 20 years. Also, the expectation of average annual 20% market growth at the end of the project was not realistic.

The direct reduction of GHG emissions of rural household biodigesters is based on a premise of linear substitution of fossil energy sources (biomass and LPG) by biogas. Several studies in developing countries found that in reality rural households do not linearly switch to renewable energy sources but develop a so called ‘stacking behaviour’ in which they use more than one energy source simultaneously instead of simply substituting the earlier ones. The extent of substitution depends not only on price of the fossil fuels but also on access to biomass collection or to purchase of LPG cylinders. On the other hand, biogas has a potential to not only solve the

[22] Estimates of expected GHG emission reduction taken from the BSRD Project Document, Part VII: Greenhouse Gas Emission Reductions

household energy problem but also to make a contribution of the by-produced bio-fertilizer for crops cultivation. These additional factors were probably not taken into full consideration during the calculations of planned GHG emission reductions.

The project aimed at removal of multiple barriers to development of biogas market. On the demand side of the market, the project successfully demonstrated the fixed dome biodigester technology and created some awareness of its benefits by smallholder farmers. However, the project was less successful in achievement of the other two conditions for strengthening of the demand. Although work on development of quality standards for biodigester installations started early in the project, at the project closure there are no tangible results of this work in terms of officially adopted and enforceable quality standards. Given the fact that quality assurance is key to the reputation of the biodigester technology, this is a rather serious underachievement of the project. Similarly, the work on improvement of affordability of the technology started with partial project grant subsidies for end users but did not culminate in development and demonstration of a viable financial mechanism that would ensure sustained demand in the absence of governmental subsidies.

The project successfully supported the establishment and growth of the private sector supply side of the bioenergy market through development and strengthening of capacities of BSP companies to provide construction, maintenance and technical advice services to biodigester owners. However, lack of viable business opportunities due to insufficient demand and absence of incentives has been the main factor limiting further growth of the supply side of the biodigester market.

Previous biogas initiatives sufficiently documented importance of appropriate enabling conditions in the form of laws, regulations and government subsidies to end-users. Probably the most critical underachievement of the project has been the lack of progress towards creation of favourable regulatory and enabling environment that would shape the biogas market through facilitation of access of potential biodigester users to financial assistance from commercial banks, micro-finance institutions and credit unions. This resulted from the fact that the project did not received sufficiently high level of political support by the Government.

In other biogas projects in Africa, the high-level political support was translated into establishment of a National Biogas Programme (NBP) as an umbrella support system with multiple functions, including oversight of the technical quality of the biodigester installations, enabling access to microfinance, and support to promotional and outreach activities.

The fact that no such national programme had been established in Egypt and no fiscal incentives had been provided for biodigester end users suggests that the policy support of the Government to the project and the BET development in general was week and insufficient to ensure full sustainability of the project technical assistance results through the planned post-project upscaling.

Based on the above, the overall achievement of the Project Objective is rated Moderately Satisfactory (MS).

Efficiency

In relation to efficiency, the evaluation examined the length of the project implementation period and to what extent the results have been achieved through economizing the use of GEF and other resources.

The official project starting date (date of signature of the Project Document by the Government) was November 2008. It was approved for a period of 5 years but due to slow implementation progress the project team requested several official extensions from UNDP and GEF. The first one-year extension came as a result of the MTR recommendations, although the MTR Report actually proposed to extend the project by two years. This was followed by three consecutive one-year extensions until December 2017. The last officially approved extension was the extraordinary 18-month extension until June 2019, however, the project activities continued until the end of December 2019. Therefore, the actual total length of the project implementation period was 11 years, more than double of the originally planned project period[23].

Initially, the project faced difficulties in recruitment of the Project Manager and this post remained vacant until mid-2010. Although the PM appointment was quickly followed by organization of the Inception Workshop (IW) on 27 October 2010, significant implementation delays persisted after IW.

The slow rate of implementation was reflected by the low disbursement of the project funds. Only 350,723 US$ had been disbursed by December 2012, i.e. less than 12% of the project GEF grant had been disbursed in the first 4 years of the project.

The first Project Manager departed for personal reasons in August 2013 and the project since underwent a lengthy recruitment process searching for a suitable candidate. The difficulties in finding the qualified Project Manager reflected general lack of expertise in the field of bioenergy in Egypt. The second Project Manager was appointed at the beginning of 2014 and departed at the end of 2016. The project financial reports show that the support for project management effectively finished at the end of 2016 as 99.6% of total project funds on project management had been disbursed by that date. From 2017 onwards, there was practically no support of the project management as the project was completely inactive in 2017-2018 awaiting formal closure. At the beginning of 2019, the Bioenergy Association took over from PMU with a little money left from the project for technical assistance and received initial financial support from UNDP and the Government. For operational costs, the Association has its own resources.

More than 1.2 million US$ unspent in the project budget made it difficult to close the project at the end of 2016 hence it was further extended three times, on an exceptional basis. The appointment of the new Head of the Bioenergy Association in 2019 revitalized the project in relation to unfinished activities related to establishment of the financial mechanism for biogas technology promotion.

[23] The project was granted a special permission to conduct TE and complete all open financial obligations in 2020.

The judgement on the efficiency of the project implementation has to be based on the fact that despite more than two times longer implementation period not all project planned results have been achieved. However, this has to be seen in context of the major external factors that influenced the project.

Since the inception, the project faced several external challenges. Firstly, Egypt experienced a lengthy period of political instability between 2011 and 2014 that adversely affected the political decision-making process and had postponed implementation decisions for the project resulting in relatively low delivery and slow implementation progress. The delivery rate in 2011-2014 was only almost 33% of the total GEF grant. However, after discounting the unspent 1,2 million US$ for the financial mechanism, the 2011-2014 delivery reaches almost 54% of the total GEF funding.

Apart from the political instability, there was another factor negatively affecting the project implementation, namely strained relationship between the UNDP CO and the Government in 2014 - 2016. The situation normalized only after the UNDP Administrator's high-level mission to Egypt in 2016. Last but not least, the devaluation of the Egyptian pound by 48% in November 2016 caused another challenge, as it affected and complicated procurement tenders.

In many cases extensions of GEF projects, although at no additional cost to the donor, result in overspending on project management as the projects pay for the cost of prolonged existence of PMU. Out of the total 11 years of this project, the project had a functional PMU only for about 6 years. The prolonged implementation is usually covered by co-financing contributions, in many cases by the implementing agency. The financial records for this project show that the total expenditures charged against the budget line "Project Management" exceeded the planned allocation of 300,000 US$ by another 102,000 US$ (34.1%). The increase was covered by co-financing contributions by UNDP and the Government.

Total project period of 11 years for a 5-year project with achievement of planned results somewhat lower than expected indicates inferior efficiency. However, considering the severity of the external factors that had negatively affected the project implementation, the efficiency in terms of the project timeline and use of resources is rated **Moderately Satisfactory (MS).**

Country ownership

The Government has taken an integrated approach to support the BSRD project. The Project Steering Committee and the Bioenergy Association integrated representatives of several key ministries and public agencies. Despite this approach, the BSRD project is generally considered as UNDP-driven programme and not a programme of the Government of Egypt.

Although the actually realized co-financing of the project by the Government indicates certain level of country ownership, the Government showed only a modest ownership of the project in terms of the policy and regulatory support as well as in terms of absence of financial incentives for end users of biogas digesters. There were no subsidies for installation of biodigesters and the development of the feed-in-tariff for biogas was also relatively slow. The specific FiT for biogas was pronounce only in 2019 but does not have any relevance for the rural households that use the energy from the biodigesters for their own consumption.

The BSRD project was developed for demonstration of the biogas digester technology in 4-5 Governorates. Through the 2014 Decree of the Board of Governorates, the Government requested to increase the originally narrower geographical focus to wider geographical areas. While on one side this can be seen as a sign of certain level of ownership of the project, on the other side the Decree called for extension of the project's relatively thin resources and fragile infrastructure over a much larger territory than originally planned that probably have negatively affected efficiency as well as effectiveness of the project implementation.

Mainstreaming

The focus of this section is to discuss to what extent the project included UNDP priorities such as poverty alleviation, improved governance, and women's empowerment**,** i.e. whether it is possible to identify and define positive or negative effects of the project on local populations**,** whether gender issues had been taken into account in the project design and implementation and in what way has the project contributed to consideration of gender aspects.

The project was designed before the release of the GEF Policy on Gender Mainstreaming[24] that expresses GEF's commitment to enhancing the degree to which the GEF and its implementing agencies promote the goal of gender equality through GEF-funded projects. Therefore, the BSRD project results framework did not include any gender-specific goals and interventions, or gender-responsive indicators. The project logframe also does not contain indicators for monitoring impact of the project interventions on poverty alleviation and empowerment of marginalized rural communities.

The GEF Policy on Gender Mainstreaming also calls on GEF and its partner agencies to analyse in GEF projects specific needs and roles of both women and men. However, gender aspects were not considered in the project monitoring and evaluation efforts either. Despite the ToR for MTR called for provision of gender disaggregated data as much as possible, the MTR Report that was completed in February 2013 does not contain a single paragraph or even a sentence on gender. The same lack of gender focus stands for the annual GEF PIRs for 2013-2020 that were available for review under this evaluation.

Due to the lack of reliable data, this evaluation can only outline the possible impacts of the project on empowerment of women and rural. Based on the available information and interviews with key stakeholders, it can be concluded that the project achieved some level of women's participation in the project activities related to demonstration of the biogas digester technology (Outcome 1) and related capacity building (Outcome 3). This effect was achieved through inclusion of female engineers in the training of future BSPs under the project.

Reportedly, the project had the first 7 female engineers out of 16 trained and certified in 2014 and further increased to total 17 either trained in 2017. The available reports also suggest that female engineers trained by the project played an important role through approaching female members of targeted rural households and convincing them about the potential benefits from biodigester uptake. Unfortunately, gender-disaggregated data were not collected systematically

[24] Policy on Gender Mainstreaming, Global Environmental Facility, May 2012

during the project implementation as the project did not take a basic gender-mainstreaming approach.

Direct benefits the project provided to female members of rural households were twofold. Traditionally, women had been engaged in a rather primitive process of cleaning livestock stables and collecting and storing animal droppings for later usage as fertilizer. As part of the installed biodigesters, the project provided specially designed canals for feeding animal waste into the biodigester units. According to PIRs, this aspect was very much appreciated by female members of participating rural households.

The other benefit was savings of time rural women had to spend in the process of purchasing LPG cylinders for domestic usage for which the women had solely been responsible. Majority of these women had been responsible for families consisting of few dozens and related daily house work that required extensive usage LPG cylinders (on average 2-3 cylinders per month). Through improvement of the manure collection and time savings on LPG cylinders purchase, the project improved quality of life of rural women.

Impact of the project on development of education and carriers of women can be presented based on the following anecdotal evidence.

In the initial training conducted in Asyut in 2013, two out of the total 10 engineers trained were females. It is supposed that similar average ratio of female trainees was achieved in all trainings throughout the project. Some of the female engineers trained by the project successfully launched start-up companies and have been providing services related to biogas installations, as documented in Boxes 2 and 3 below[25,26].

Boxes 2 and 3: Examples of female-led biogas start-ups in Egypt

In Egypt, Small-scale Biogas Production Pioneered by a Woman

After graduating in engineering in 2011, Mona al-Khodeiry from Luxor decided she wanted to create her own company. Specifically, she wanted to remedy the constant power outages that take place across Egypt while, at the same time, providing a solution to the problem of solid waste management.

In September 2014, after attending a four-month training course on biogas provided by the Ministry of Environment, at the age of 26 she started her business. The course had strengthened her interest in biogas and had taught her the basics of constructing and maintaining a biogas unit.

El Khodairy started a biogas company called El Khodairy Biogas, later renamed Ecotaqa, selling units that produce biogas and biofertilizer from animal manure. Khodeiry started building her first biogas units in the rural areas of Upper Egypt. The aim was to use animal and agricultural waste, which could be found in almost any house, and place it in underground units. Fed with the organic materials, the units could generate gas – which could be used to produce heat and power – and provide organic fertilizer – which could be used by farmers to improve crop yields.

As a result of her hard work, within one year Khodeiry built 95 biogas units in the governorates of Luxor, Qena, Sohag, Assiut, Minya, Fayoum, Sharkia, and Dakahlia.

She had to carve a place for herself not only as a renewable energy entrepreneur, but also within the male-dominated agricultural sector. “People question how a girl can own a company, but I feel I can be a pioneer.”

A Leading Female Entrepreneur in the Biogas and Organic Fertilizers Market

Alshaimaa Omar from Qulfao in Sohag, attended Minya University where she graduated as a Chemical Engineer from the Faculty of Engineering in 2012. After graduating, she continued to feel a growing concern around the problem of garbage and waste management and dreamed of owning a company that focused on bioenergy—organisms—but wasn’t sure how to turn her dream into reality.

In 2013, Alshaimaa came across an opportunity to expand her knowledge on bioengineering when the Ministry of Environment announced training on installation of household biogas units in Assiut. After the training, Alshaimaa succeeded to deliver the first 13 bioenergy units. This achievement inspired her to start her first company, BioMix, in Sohag in August 2014. The new company managed to install more than 200 household biogas units in 14 governorates.

In 2018, BioMix was merged with another small company to establish a new entity called “BioMax”, owned by three partners. Until now, BioMax has established more than 500 biogas units on small and medium scales.

In addition to the hosehold biodigesters, BioMax also established three farm scale units with also an average revenue of 1 million EGP per month and a biogas lab and fertilizers plant in the Agriculture Department of Menofiya University, to accommodate student’s researches.

BioMax is currently considered the second biggest local company in the biogas and organic fertilizers market making Alshaimaa a leading female entrepreneur in a market previously dominated by males.

[26] http://www.seedegypt.org/2019/07/09/alshaimaa-omar-a- t/

Reportedly, women in rural households were interested in biogas because many of the benefits biogas brings have gender dimensions, in particular in relation to their traditional roles in the household. The health burden of household air pollution falls more on women than men and women are also the primary beneficiaries of biogas interventions that reduce the need to collect wood. However, the time savings on firewood collection could not be absolute as the women might be required to undertake some work related to operation of biodigesters.

Therefore, women to some extent affect decision-making on uptake of biogas digester units, but the final decision is often dependent on their husbands' ability to finance the biodigester installation.

It is recognized that empowerment of women and their access to sustainable energy have a significant positive impact on sustainable economic growth and inclusive social development, that are key drivers of poverty alleviation and social progress. Due to different roles, perception and opportunities for men and women in contributing to and benefiting from renewable energy technologies, it is important to ensure that gender aspects are taken into full consideration in future interventions on biogas.

The project aimed to contribute to alleviation of poverty in rural areas by promoting their economic and social development and by creating additional job opportunities. However, it has to be noted that the biodigester end users are not amongst the poorest members of rural communities since they have to have a few cows to produce the manure feedstock for the biodigesters. By the same token, the masons and engineers trained to form BSP companies are also not affected by poverty as they have to have some starting capital for BSP registration and Poorer members of rural neighbourhood might have benefited from temporary job opportunities for assistance to BSPs in construction of biodigesters.

Systematic reporting on gender mainstreaming and empowerment of marginalized groups is not only compliant to the GEF policies but also in line the UNDP institutional mechanism to ensure accountability for delivering gender equality results and achievement of poverty alleviation targets. Unfortunately, there were no performance indicators in the project results framework that would measure the project's achievements in assistance to gender and marginalized groups. Consequently, no information on this type was collected during the project's monitoring and evaluation activities.

Sustainability

Sustainability of a project is judged by the commitment of the project stakeholders to continue and replicate the project activities beyond the project completion date. The terminal evaluation is expected to identify critical risks to sustainability, namely institutional/governance risks, financial, socio-political, as well as environmental risks, and explain how these risks may affect continuation of the project benefits after the project closure.

Institutional framework and governance

The principal element important for the institutional sustainability of the BSRD project has been the establishment of the Bioenergy Association for Sustainable Development (BASD) that effectively took over from the project PMU. Official registration and start-up of the Association

took some time but the new CEO that was appointed in 2019 brought its activities up to speed. In addition to continuation of the project activities, the Association has taken a leading role in development of parallel projects such as the ILO/NBK biogas initiative in the Minya Governorate.

The purpose of the biogas sector development has been associated presumably with the sustainable access to renewable energy. However, this does not sufficiently explain the integrated livelihood development potential and the diverse impacts of biodigesters on livelihood development. The biodigester technology provides multiple and diverse benefits for energy, agriculture, soil fertility, climate, as well as health and sanitation.

Governmental support to biodigester technology demonstration and uptake in Egypt has been provided mainly through the Ministry of Environment and its affiliated Agency (EEAA). Several other ministries had been represented in the project PSC and some continue as members of the BASD Board of Trustees. However, this level of involvement appears to be rather formal and combined with relatively weak regulatory framework does not ensure fully coordinated cross-ministerial support to further development and upscaling of biogas units, as demonstrated by the real case summarized in Box 5 below.

Box 5: Information on real case of a Biogas Service Provider in Egypt

A Biogas Service Provider (BSP) company has constructed a biogas digester unit of capacity 50 m3/day on a rented land area of 200 m^2 with the plan to sell the produced bio fertilizer on the market. The capital investment cost of the unit was about 250,000 EGP with additional expenditures such as the cost of labour for the construction and monthly land rental. Before completion of the construction, police came to the site and ordered the work to be stopped. The company is facing legal issues for razing agricultural land and is required to pay a fine of 15,000 EGP and demolish the already constructed biodigester unit.

In order to provide assistance, the Bioenergy Association issued a supporting letter addressed to the local authority stating that the company is officially registered as BSP under the Ministry of Environment and making reference to a Decree by the Ministry of Agriculture that stipulate that construction of biogas digester units is amongst activities exempted from restrictions on construction on agricultural land. Moreover, BASD also sent a request to include the Ministry of Agriculture as a member of the BASD Board of Trustees as the Ministry was not included in the first set of BASD Board members.

Although the case described above appears to be a rare incident, it demonstrates in a nutshell the continued deficiencies of the specific institutional and legal framework that constitute a hindrance to wider dissemination and uptake of biodigester units in Egypt.

Therefore, the main risk to the institutional sustainability is the continued lack of supportive policies and regulatory frameworks for development of the biogas market, including development of standards for the design and construction of biodigester units and biogas systems' operation guidelines. The work on standardization of domestic biogas design, construction and after sales service started relatively early in the project but did not produce tangible results. Consequently, the project did not establish a procedure for regulation of the biodigester market in terms of product and operation quality assurance.

In the first years of the implementation, the project established a dedicated website linked to the Ministry of Environment, but the website was discontinued. Only recently BASD established its own website. Knowledge management is part and parcel of the institutional framework but there were no downloadable documents at the BASD site at the time of preparation of the TE Report.

Based on the above, the institutional framework and governance sustainability is rated **Moderately Likely (ML).**

Financial sustainability

The financial sustainability of the project activities depends on the availability of funding for biodigester purchase and existence of specific support functions and activities, such as functional BSPs. In general, the perspectives for financial sustainability are clearly better in countries with considerable numbers of functional biodigesters as earning possibilities for BSPs and with available government subsidies to end-users. In Egypt, the total number of installed biodigesters is relatively low, counted at the level of around and up to 2,000 units and there are no end-user subsidies provided by the Government.

In this situation, the main parameter for assessment of financial sustainability is affordability of biodigester purchase and availability of adequate financial resources to rural households. Financial and economic viability of biodigester purchase can be judged according to several criteria but the basic indicator for financial viability is the Simple Payback Period (SPP) as the time required to recover the initial investment, calculated by dividing the total initial investment by the net profit.

SPP of the biodigester purchase depends on the range of benefits taken into consideration in the net profit estimates. Traditionally, biogas projects had been presented to provide cost savings only. However, practical experience shows that biogas installations provide to top the cost savings by revenue generation. Cost savings are achieved through substituting firewood with biogas and replacing mineral fertilisers with bio-slurry for own cultivated crops. Revenue can be generated through better crop quantity and quality (due to improved fertilizing practices) and eventual sale of bio-slurry on the market.

Numerous previous studies estimated that rural households can recover their total investment cost of biodigester units in 2-3 years. Recently, BSRDA under this project commenced a comprehensive techno-economic assessment with the aim to evaluate the profitability and feasibility of implementing biogas units in Egypt. This analysis established the payback period of a single household biodigester unit of 2-6 m^3 volume to 10-15 months.

Considering that the technical lifetime of a fixed dome biodigester installation is up to 15-20 years and the payback period is 1- 2 years, the investment into a biodigester would make economic sense. Nevertheless, this appears to be an ideal payback period based on theoretical assumptions and average prices of biodigester inputs and outputs. Affordability of biodigesters is a critical factor for estimation of demand for the technology and market growth. It is desirable to verify the SPP estimate in real cases of biodigester installations.

However, there are several setbacks that hinder large-scale uptake of biodigesters by Egyptian rural households. It is well documented from similar projects in other countries that cost reduction and availability of end-user credits and/or subsidies lower the affordability threshold for biodigester purchase. The relatively low political and administrative support for biodigester market development in Egypt translates into higher costs of BSPs per biodigester unit due to inability to benefit from economies of scale that could bring down the cost per unit in case of higher uptake.

Farmers will invest when they understand all benefits biodigesters can bring to their households and more BSP companies will enter when they see a market and potential for making profit.

However, lack of end-user subsidies and absence of micro-credits both for farmers and BSPs poses a serious risk to financial sustainability of the project, particularly due to the fact, that the project failed to demonstrate viable mechanisms for removal of financial barriers to developing the BET market in Egypt.

Based on the above, the rating of financial sustainability is **Moderately Likely (ML)**

Socio-political sustainability

Switching from solid fuels to biogas lead to improvements in the livelihoods and health of the end-users and further biodigester market development will lead to inclusive economic development. The recognized economic effects of biogas programmes on the rural households include primarily reduction of energy consumption for cooking and lighting. Reduced use of synthetic fertilizers and improvement of yields thanks to the use of bio-slurry creates potential to sell part of the crop harvest to generate additional income.

However, rural biogas support programmes do not automatically contribute to poverty alleviation as the beneficiaries have to have at least few cows to operate the biodigester and need financial resources to make the up-front investment.

A necessary condition for the improvement of existing and development of new supportive policies and regulatory frameworks is full understanding of all benefits that biodigester units bring to rural households and of socio-economic impacts beyond the households and rural communities. The role of the Government needs to be fully recognized in order to stimulate demand and attract interest of financial institutions.

Use of firewood for cooking releases carbon monoxide and particulates at levels detrimental to human health. The positive health effects of using biogas systems occur through reduction of exposure to indoor air pollution and better hygiene and sanitation where improvements result from the cleanliness of biogas use in the kitchen and possibility of connecting toilets to the biodigester. The socio-political benefits therefore include reduction of public health costs of treatment of diseases from indoor and outdoor air pollution.

The prevailing positive socio-economic effects of the biogas technology in rural areas suggest that there is no risk to the socio-political sustainability that is rated **Likely (L).**

Environmental sustainability

Decreased demand for baseline fuels (wood or LPG), alleviation of methane emissions from livestock manure management, and limitation of synthetic fertilizer use are the direct positive environmental impacts of utilization of the biodigester technology. However, a reduced consumption of baseline fuels not necessarily produce a positive overall net effect towards climate change since the net GHG emissions of a biogas projects can be affected by fugitive emissions from biodigesters. Methane as the main component of biogas has the Global Warming Potential (GWP) 28. The methane fugitive emissions can vary depending on the size and type of a biogas installation and its functionality.

Reduced collection of firewood for cooking has positive effects on reduction of local deforestation and limiting its detrimental effect on soil quality through decreased surface run-

off. There are no negative environmental effects as water, soil and air pollution from operation of the biodigester units are negligible. However, the functioning of biogas digesters can be limited in areas of low water availability.

Egypt is currently highly dependent on the river Nile as the main source of freshwater for economic activity and livelihoods. In this regard, concerns have risen over the expected implications of the Grand Ethiopian Renaissance Dam (GERD) on Egypt as the downstream country of the Nile basin. It is projected that during the filling of the GERD reservoir and during GERD operation in years of low water flows, the Nile water flows to Egypt would be reduced by 25%. As Egypt has already been experiencing a sharp decline of renewable freshwater per capita (from 900 m^3 in 2000 to 600 m^3 in 2017), it is expected that the effect of the GERD - in addition to climate change impacts - would only exacerbate the water issue in Egypt, edging the country closer to severe water scarcity in the future[27].

Loss of fresh water in vulnerable areas of Egypt would have negative effect on availability of basic production inputs for livestock farmers, such as pastureland, feed and water for animals, and this would consequently lead to reduced availability of manure for biodigesters. Also, water is an important ingredient for preparation of biodigester feedstock mixture. However, the negative impacts from lack of water can be expected to happen only in medium- to long-term future.

Based on the above, the environmental sustainability is rated **Likely (L).**

Technological sustainability

The report 'Logical Framework for Household Biogas Units in Rural Egypt' commissioned recently by BASD has identified the main causes of malfunction of the biodigester units that had been installed under various development assistance projects. Despite the fact that a survey conducted in 2019 on a sample of 239 installed biodigesters found only less than 13% of installed biodigester units functional, the BASD report does not conclude that the fixed dome biodigester design has failed technologically. Based on interactions with biogas companies and individual users, the report compiles a list of concrete interventions for rehabilitation of the inactive biodigesters and certain measures to be taken to sustain biodigester installations in the future.

Application of special biogas burners design is a prerequisite of biogas utilization, but this could be difficult in some developing countries. The report suggests possible adjustment of conventional burners through expansion of the injector cross section to increase the flow rate of biogas or increase of the supply of air and larger gas jet opening size for better combustion of biogas.

Attention has to be paid to protection of biogas pipes and connections in order to avoid accidental damage to the pipelines. Another measure is related to ensuring proper feeding of biodigesters in terms of cow manure and water. A manure chamber and a water tank could be

[27] The Egypt's First Biennial Update Report to UNFCC, Ministry of Environment, Egyptian Environmental Affairs Agency, 2018

implemented next to the biodigester in case the organic feedstock and/or water have to be transported from distances to the biodigester.

The above rehabilitation interventions and measures are not very costly and could be implemented through better connection between research/academic institutions and biogas companies/industries.

Although the rating is not mandatory, technological sustainability of the project is rated **Likely (L).**

Since overall rating for sustainability should not be higher than its lowest rated dimension, the overall rating for sustainability is rated **Moderately Likely (ML).**

Impacts

Biogas projects are known to produce impacts at the level of rural households as well as at the level of society at large. The household level impacts include savings of firewood and related reduction of time and workload for women and children for firewood collection, although the time savings are not absolute as some time has to be spent on collection of manure feedstock and water for biodigester operation. Additional impact at the household level is production of bio-slurry.

On top of the economic benefits to rural households, the biogas projects provide opportunities for direct employment of engineers and masons in BSPs. Some additional jobs are also created in BSPs that manage to grow from the initially small size. At the level of the society, the main impacts include reduction of local deforestation of GHG emissions. Additional impacts include reduced public health costs following lower indoor and outdoor air pollution in rural households and communities.

These impacts are realized only when the end-users ensure proper and regular operation of the biodigesters. The recent evaluation of biodigesters' functionality proved that this was the case in less than 15% of the assessed biodigesters. Therefore, the extent of real impacts produced by the project remains questionable as no real data on substitution of firewood, use of bio-slurry and jobs creation had been collected under the project.

Exit strategy

An exit strategy is explicitly linked to sustainability as it considers means of ensuring durability of the project achievements after the discontinuation of the technical and financial support by the donor. A sound exit strategy should be planned early in the project implementation and should be based on established partnerships, developed local organizational and human capacities and on mobilization of local and external resources.

The BSRD Project did not develop an explicit and written exit strategy as a concise document outlining steps and activities to ensure sustainable management of the achieved results by the project stakeholders after the end of the donor support. However, there are some elements of an exit strategy that have recently been considered by the project stakeholders.

The report 'Logical Framework for Household Biogas Units in Rural Egypt' commissioned recently by BASD contains a section with proposed actions for rehabilitation of non-functional

biodigesters that had been installed under the BSRD Project. This section makes a reference to a recently conducted assessment of 209 previously installed household biodigesters found construction details as the primary reason for malfunction in less than 5% units while in almost 80% of the units for the malfunction were outside the biodigester construction, namely either broken down biogas burner or issues related to running of the units.

This analysis suggests that rehabilitation of the household biodigester units would not require costly overhaul and a vast bulk of the units could be brought back to operation by relatively simple and inexpensive actions such as modification or exchange of burners and technical assistance on proper feeding and operation of the biodigesters.

Chapter 6 of the same report, titled 'Roadmap Development', is in fact a sort of a blueprint for upscaling the biogas technology in Egyptian rural communities. It names four areas as the most important for a future biogas programme, namely establishment of advisory and oversight institutions, research and development, a financial scheme as well as awareness and capacity building.

Key factors that affected implementation and achievement of outcomes

Project design

The BSRD Project design followed the programming guidance of the GEF-3 cycle that required all the major barriers to renewable energy technologies (RETs) to be removed simultaneously for RETs to be available on a sustainable basis. In line with this premise, the GEF-3 programming guidelines stipulated that:

"……hardware should only be provided where technology demonstrations can achieve clear benefits, such as reduced uncertainties over costs, performance, and market acceptance. Production capability, access to financing, stakeholder partnerships, information channels, marketing and distribution systems, and institutional capacities are all parts of a properly functioning market".[28]

The above guidance led to a relatively complex design of the BSRD Project with included on-granting/financial guarantee component for which UNDP as the GEF Implementing Agency neither had sufficient implementation capacity nor previous experience. As a direct consequence, UNDP did not have policies and operational rules/regulations in place for on-granting and for other (non-grant) financial mechanisms such as revolving funds. This situation had not been recognized at the project PIF/PPG stage and was fully acknowledged only after several years of implementation.

The lack of policies and operational rules for the project financial mechanism was not specific to the BSRD Project in Egypt as few GEF-3 projects in other countries encountered similar problems. Nevertheless, elaboration of the UNDP financial policies for on-granting and

[28] GEF-3 Operational Program Number 6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs; GEF 2003

guarantee funds was conducted in parallel with the implementation of this project and therefore could not have any positive impact on the project in time of need.

Two deficiencies in the project design had particularly bad effect on the implementation. Firstly, as discussed in the section 'Analysis of project results framework', the project results framework had some internal inconsistencies and incorrectly defined project indicators and their target values.

Secondly, the section 'Project risks' shows that identification of the project-related risks at the design phase was incomprehensive. In particular, the risk analysis did not address critical risks related to two project components, namely creation of enabling policy framework (Outcome 2) and elaboration of a financial support mechanism (Output 4.3) that in the end proved to limite the progress towards and achievement of the project objective.

Combination of the above two deficiencies in the project design precluded monitoring of timely progress to the project results. Full acknowledgement of criticality of establishment and capitalization of BDF and recognition of lack of progress in respect thereof would provide more time to address the problem early within the project timeframe and not near to the operational closure as it was the actual case.

Project implementation

There were two major factors that affected implementation of the project and progress towards the planned results. Challenges in recruitment of the first PM delayed the actual start of the project implementation by almost two years. Unfortunately, the PM appointment was quickly followed by the outburst of the Arab Spring that further slowed down the implementation. There was also a delay in recruitment of the second PM.

The lack of progress in the first two years of the project implementation period had a negative consequence as it reportedly caused loss of the entirety of the initially pledged co-financing contribution from the private sector.

Recruitment of a competent PM in 2014 and his ability to quickly establish rapport with the key project stakeholders brought the project back on track and accelerated the progress towards achievement of the planned results.

The most important implementation factor was the failure to capitalize the Bioenergy Development Fund (BDF) as the proposed financial mechanism for the project. This resulted from a sequence of implementation issues and ultimately negatively affected achievement of Outcome 4 and hampered the financial sustainability of the project.

The basic idea of BDF was to replace the project subsidies provided for the biodigester installations in the initial project period by a more sophisticated financing mechanism based on loans and eventually equity and partial guarantees that would leverage additional resources from the financial markets outside BDF, such as specific Government funds, contributions from commercial banks, and eventually also CDM financing, in order to achieve the long-term replication targets of the project.

The approved Project Document envisaged creation of BDF in the first year of the project implementation and its subsequent capitalization in tranches. The reality, however, was

different as the work on establishment of BDF started only in 2015 when a consultant was hired to provide recommendations on the proposed financial vehicle. At that time, more than 900 of the targeted 1,000 household-level biodigester installations had already been constructed. Operationalization of BDF was expected only in late 2016 at the earliest. Consequently, financing of all biodigester installations commissioned by the project in the period June 2012-June 2016 was financed through grants and partial grants provided by UNDP/GEF funds without any assistance of the envisaged financial mechanism.

As a member of PSC and the GEF Implementing Agency of the project, UNDP was expected to oversee overall management of BDF and ensure proper use and reporting of the GEF resources. Although UNDP communicated to the Government the required conditions and milestones for endorsement of BDF as the financial mechanism for the project, including establishment of the Fund charter and operational guidelines, a system for borrower and loan evaluation, procedures for approval of loans and buy-down contracts, as well as modalities for monitoring of the Fund performance, the progress was very slow.

In fall 2015, the Government presented to UNDP a 6-months project extension request. The only major milestone accomplished by that time was establishment of BASD but the extension request did not provide detailed information on the composition or capacity of the BASD governance, due diligence on its lending capabilities, operational and staffing structure and financial management guidelines. It was also unclear how the remaining technical assistance activities listed in the extension request would dovetail into the financial vehicle and what could be realistically achieved in the requested 6-months extension.

Before the extension request, the Government had already transferred to UNDP CO its cost-sharing entitlement for the financial vehicle and the extension requested transfer of these funds together with the 1.2 million US$ earmarked in the GEF grant for the vehicle to BASD. Lack of information on the status of the financial vehicle and potential deviations in its development from the Project Document, no track record and information how the entity would operate, together with the perspective of project closure and associated loss of UNDP/GEF oversight in 6-months created a major reputational risk to UNDP. Therefore, the extension was approved without the capitalization of BDF.

The project experienced almost 1.5 years of inactivity after the departure of the second PM in mid-2016. In February 2018, the new UNDP RTA together with PTA visited the project. Among the various options discussed during the mission, it has been agreed to utilize the Performance Based Payment (PBP) mechanism for low-value payments (up to $ 5m). This new modality had already been approved for use and guidance for its use was available in UNDP POPP. The Government proposed the Social Fund for Development (SFD), an organization with more than 25 years of accumulated experience in financing poverty alleviation and job creation in Egypt, as a third party to be contracted for hosting and operating the project financial mechanism and thus become a Responsible Party (as per UNDP rules) to the project.

This arrangement came never into force as SFD was replaced by the Micro, Small and Medium Enterprise Development Agency (MSMEDA)[29] in November 2018 as a new funding mechanism to support small, medium and micro enterprises as well as entrepreneurship. Consequently, the portion of GEF funds earmarked for the financial vehicle (with the exception of the 1st tranche of 150,000 US$) remained unused by the project.

The primary reason for the failure to launch the financial mechanism in line with the provisions stipulated in the Project Document was the delayed start of this activity. The concrete proposal for establishment of BDF was prepared in 2016 close to the end of the third project extension period so monitoring of functionality of the vehicle as per the Project Document would require another 4-5 years of project implementation. The institutional changes on the Government side, in particular scrapping SDF and slow progress of establishment of BASD were secondary factors that aggravated the negative effect of the delayed start.

Achievement of outcomes

As discussed in the section Effectiveness, the project has largely achieved its outcomes on demonstration of the biogas technology and capacity building of the main actors of the biogas market but was less successful in the area of supportive policy frameworks and the financial mechanism.

The summary of ratings of the selected evaluation criteria is in the Table 19 below.

Table 19: Overall project ratings

Evaluation Criteria	Evaluator's Rating
Monitoring and evaluation: design at entry	Satisfactory (S)
Monitoring and evaluation: implementation	Moderately Satisfactory (MS)
Overall quality of monitoring and evaluation	**Moderately Satisfactory (MS)**
Quality of UNDP Implementation	Satisfactory (S)
Quality of Execution - Executing Agency	Satisfactory (S)
Overall quality implementation / execution	**Satisfactory (S)**
Relevance	**Relevant (R)**
Effectiveness	**Moderately Satisfactory (MS)**
Outcome 1	Satisfactory (S)
Outcome 2	Moderately Unsatisfactory (MU)
Outcome 3	Satisfactory (S)
Outcome 4	Moderately Satisfactory (MS)
Efficiency	**Moderately Satisfactory (MS)**
Overall Project Objective rating	**Moderately Satisfactory (S)**
Overall likelihood of sustainability	**Moderately Likely (ML)**
Institutional framework and governance	Moderately Likely (ML)
Financial	Moderately Likely (ML)
Socio-political	Likely (L)
Environmental	Likely (L)
Technological[30]	Likely (L)

[29] Established by virtue of the Decree of the Prime Minister No. 947/2017, amended in November 2018.
[30] Assessment of technological sustainability is not mandatory for evaluation of GEF projects. It was added on request of the Implementing Agency.

CONCLUSIONS AND RECOMMENDATIONS

Based on the facts collected and analysed in the previous section, this section elaborates conclusions as judgments supported by concise findings from the previous sections of this report. Each conclusion is linked with a recommendation as a corrective action proposed to be taken by relevant project stakeholders to address the deficiencies identified in the findings and conclusions.

This Terminal Evaluation makes three sets of recommendations. The first set of recommendations is provided for immediate follow-up and/or reinforcement of the achieved results of the project. These recommendations are suggested for implementation as soon as possible using the existing institutional capacities and frameworks that had been created by the current project. The second set of recommendations addresses programmatic issues relevant for preparation of future GEF/UNDP rural biogas projects and the third set is provided for issues relevant for follow up activities on biogas technology promotion and development in Egypt.

Recommendations for immediate follow-up

Finding 1: In the Project Document, 1.2 million USD were set aside for a Bioenergy Development Fund (BDF) as a guarantee/loan financial mechanism to support the technical assistance part of the project. However, a proposal to implement the mechanism was prepared when the technical assistance components had almost been completed. The Memorandum of Understanding between the Government agencies designated to implement the financial mechanism was signed only few months before the end of the last approved extension of the project.

Conclusion 1: It was envisaged to operationalize BDF in the first year of the project and monitor its functionality during the following years. At the time of the project preparation, UNDP did not have experience with operation of such financial vehicle and later it turned out that the mechanism was not in line with the UNDP financial rules and regulations. Transfer of the funds earmarked for BDF to the designated Government agency shortly before the project operational closure would constitute a reputational risk for UNDP as the latter agency would lose oversight of the financial mechanism shortly after its launching.

Recommendation 1: UNDP CO in cooperation with EEAA should perform financial closure of the project and return the unspent balance of the GEF grant including the unspent amount earmarked for BDF.

Finding 2: A recently conducted assessment of 209 previously installed household biodigesters found construction details as the primary reason for in less than 5% units while in almost 80% of the units for the malfunction were outside the biodigester construction, namely either broken down biogas burner or operational issues related to running of the biodigester units.

Conclusion 2: Sub-optimal performance and presence of non-operating biodigesters in rural neighbourhoods creates a bad impression about the biogas technology that discourages potential

future users and negatively influences prospects of the biogas technology upscaling. Therefore, rehabilitation of the dysfunctional biodigester units should be undertaken as a matter of urgency in order to enhance reputation of the technology in rural neighbourhoods. It is possible that rehabilitation of some non-operational household biodigester installations would not require major overhaul and a sizeable portion of the units could be brought back to service by relatively simple actions such as adjustment of burners and technical assistance on operational issues.

Recommendation 2: The Bioenergy Association for Sustainable Development (BASD) should prepare a plan for rehabilitation of at least part of the biogas installations that had been found out of service.

Finding 3: Although commonly used burners are prone to corrosion, many farmers prefer them over specially designed biogas burners for financial reasons. The assessment of rural household biodigesters revealed that defective burners were the prevailing reason for out-of-service biodigester units.

Conclusion 3: Utilization of biogas as energy source for cooking and lighting is the most appreciated benefit of the biogas technology by rural households. Proper maintenance and use of special biogas burners are one of the main prerequisites for sustained service of the biodigester units.

Recommendation 3: The Bioenergy Association for Sustainable Development in cooperation with universities should explore possible ways of repair and adjustment of burners commonly used in biogas installations.

Finding 4: At the beginning of the BSRD project, EEAA created a special link to project reports and studies related the BSRD Project elated studies. Unfortunately, the repository of bioenergy-related studies was not updated. The BASD website does not contain any knowledge materials originating from the project.

Conclusion 4: Specific knowledge and experience collected and documented during the project implementation is an important tool for active promotion and future upscaling of the biogas technology.

Recommendation 4: UNDP CO should assist the Bioenergy Association to establish an online portal for biogas in Egypt in order to provide a common platform for academia researchers, BSP companies, investors and rural development decision makers.

Finding 5: Numerous previous studies estimated that rural households can recover their total investment cost of biodigester units in 2-3 years. Recently, BSRDA under this project commenced a comprehensive techno-economic assessment with the aim to evaluate the profitability and feasibility of implementing biogas units in Egypt. This analysis established the simple payback period of a single household biodigester unit of 2-6 m^3 volume to 10-15 months.

Conclusion 5: Considering that the lifetime of a fixed dome biodigester installation is up to 15-20 years and the payback period is 1- 2 years, the investment into a biodigester would make economic sense. Nevertheless, this appears to be an ideal payback period based on theoretical assumptions and average prices of biodigester inputs and outputs. Since affordability of

biodigesters is a critical factor for estimation of demand for the technology and market growth, it is desirable to verify the SPP estimate in real cases of biodigester installations.

Recommendation 5: The Bioenergy Association should use the existing BSPs for data collection necessary for independent verification of the payback period for the newly installed biodigesters under the on-going ILO/NBK biogas activity in the Menya Governorate.

Finding 6: Although development of product standards for biogas digesters was initiated early on, it is still work in progress without tangible results at the project closure.

Conclusion 6: Lack of product standards and insufficient quality control result in failure of biodigesters' operation.

Recommendation 6: The Biodigester Association should accelerate the work on development of product standards and elaborate a plan for the institutionalization of the quality control function for biogas digesters.

Finding 7: Recently conducted techno-economic assessment of rural biodigester units in Upper Egypt show that bio-slurry as the associated product of biodigesters has a potential to provide additional revenues for rural households from increased own agricultural production or from selling as a fertilizer on rural markets. The project catalysed research work on the use of bio-slurry for crops cultivation. Egypt has a relatively advanced network of Agricultural Extension Service (AES) that encompass multiple aspects of agriculture, including supply of timely information on sources of farming inputs, linking of farmers with available credit facilities and provision of education services to farmers.

Conclusion 7: Masons and BSP engineers educated by the project provide training of biodigester owners on construction, operation and maintenance of the biodigester units. Since the BSP expertise is not related to agriculture, they can offer only basic and general advice on the biogas - agricultural production nexus and can't supply more detailed and location/crop-specific information on benefits of the bio-slurry use as fertilizer. Establishment of systematic links between BSPs and AES would facilitate diffusion the biogas technology and use of bio-slurry to rural households, particularly in remote areas.

Recommendation 7: UNDP CO should assist the Bioenergy Association for Rural Development for inclusion of representatives of the Egyptian Agricultural Extension Service on BSDA Board of Trustees. Involvement of AES will facilitate inclusion of agricultural extension officers in the activities under the on-going biogas programme financed by ILO/NBK.

Finding 8: While the BSRD Project was successful in establishment of partnerships with important domestic stakeholders, it did not create sufficient linkages with relevant organizations and projects outside the country.

Conclusion 8: UNDP has only a small portfolio of biogas projects in Africa. However, initiatives aiming at biogas market development that are being implemented in several African

countries under bilateral donor funding can be source of valuable experience related to establishment of enabling policy and regulatory frameworks and operationalization of sustainable financing mechanisms for biogas market development.

Recommendation 8: UNDP CO should assist the Bioenergy Association to establish links with on-going biogas projects in other African countries for exchange of information and experience.

Recommendations for future programming of UNDP rural biogas projects

Finding 9: The Egyptian Environmental Affairs Agency (EEAA) hosts the GEF Operational Focal Point and is therefore the country hub for all programming of the GEF-funded activities. In line with the NIM management arrangements for implementation of UNDP/GEF projects, EEAA assumed responsibility for creation of a network of stakeholders for the BSRD Project. The established BSRD network in Egypt included stakeholders from various agencies with the direct linkages to the energy, environment and rural development functional areas.

Conclusion 9: The leading role of GEF OFP is an inherent feature of the GEF-funded projects that address environmental issues. However, in addition to the environment, energy and rural development topics, rural biogas projects address also agricultural development. Experience from rural biogas projects implemented in sub-Saharan Africa prove that such projects require strong and active involvement of line agencies with mandates related to agricultural development and land reform.

Recommendation 9: It is recommended that for rural biogas projects, UNDP in cooperation with the Governments of the projects' recipient countries, consider inclusion of ministries with authority in the agriculture and land reform areas. Such involvement is critical for future as well as currently implemented rural biogas projects.

Finding 10: At the project outset, Egypt did not have an explicit policy and regulatory framework to encourage wider adoption and use of the biogas technology in rural areas. Despite its undoubted potential, biogas currently has only a marginal share between the renewable energy resources in Egypt therefore has not been sufficiently high on the political agenda.

Conclusion 10: The development of a biogas sector requires a number of functions to be implemented by a heterogeneous group of actors with different backgrounds, interests, and jurisdictional domains. A proven way to ensure functionality of such multisectoral work and establish a permanent driving force for promotion of biogas technologies is to elevate rural biogas initiatives to a level of a National Biogas Programme (NBP).

Recommendation 10: UNDP should advise the recipient Governments of rural biogas projects to consider establishment of a National Biogas Programme in order to improve the political visibility and ensure horizontal integration of actions and interests across the relevant sectors and line agencies.

Finding 11: The results framework of the BSRD project contained only simple indicators on product and market creation such as the number of biodigester units installed and the number of BSP companies established, as well as several indicators without measurable targets at the level of project outputs.

Conclusion 11: Poor definition of result indicators for rural biogas projects precluded correct monitoring of implementation progress towards stages of biogas market creation and systematic collection of information related to achievement of expected outcomes and socio-economic impacts.

Recommendation 11: In formulation of rural bioenergy projects, UNDP and the recipient Governments should ensure setting of milestones for measuring implementation progress and inclusion of SMART result indicators and targets. In addition to indicators for product and market creation, rural biogas projects should also have indicators for product and market development, such as adjustments of the biogas digester design, number of BSP assistance cases, number of jobs created, etc.

Recommendations for future rural biogas initiatives in Egypt

Finding 12: The BSRD Project was successful in demonstration of the fixed dome biogas digester technology and in raising awareness about the technology in rural communities. It also succeeded in building capacities of a relatively small pool of BSP companies for provision of construction and maintenance services to biodigester users. Affordability of the household biodigester units remains to be a major barrier as access of rural households to credit financing is still very limited.

Conclusion 12: In the early years of implementation, the project suffered from unstable political situation and related delays in adoption of required legislation and in provision of enabling policy frameworks by the Government. At the end of the project, the legislative situation has been improved and the current regulatory frameworks are more conducive to implementation of rural bioenergy initiatives.

Recommendation 12: The Government of Egypt in cooperation with UNDP should explore possibilities for preparation of a follow-up project under funding from GEF and/or other interested donors.

Finding 13: The BSRD Project supported installation of household biodigesters in 18 Governorates instead of the initially planned 4-5 Governorates. There were 18 officially registered BSP companies at the time of TE. The fact that a considerable number of the units is out of service suggests that the supply side of the biogas market established by the project is unable to effectively reach out to the biodigester owners in rural neighbourhoods.

Conclusion 13: The number of officially registered BSP companies was too low to ensure effective outreach to all biodigester owners and timely provision of repair and maintenance services to the installed biodigester units. The current modality of BSP operation has to be changed in order to enable BSPs to identify high potential client areas and satisfy the demand for technical advice and repair services of decentralized rural biogas applications in the future.

Recommendation 13: UNDP CO and the GEF Small Grants Programme should assist the Bioenergy Association in linking the registered BSP companies and trained biogas engineers to local agri-businesses or associations in rural areas and facilitate creation of

channels for a more systematic outreach to biodigester users and increase effectiveness of BSPs in delivery of technical advice provision of repair/maintenance services.

Finding 14: Affordability of biogas digesters remains the principal barrier to wider dissemination of the technology. The BSRD Project had financed more than 1,000 household-level biogas digesters through full or partial grant financing without participation of banks and micro-finance institutions. Since 2019, the Bioenergy Association has been involved in the ILO/NBK biogas initiative that supports establishment of 60 household biogas units in some villages in the Minya Governorate. This initiative offers grants or partial grants funding of the new units under the NBK corporate social responsibility programme.

Conclusion 14: The political instability in 2011-2013 and postponed adoption of the Microfinance Law were strong external factors that hampered efforts to attract interest from commercial and semi-commercial banks for capitalization of the Bioenergy Development Fund. In recent years, the legislative situation related to microfinancing in Egypt has improved but rural biogas programmes are not yet perceived secure for microfinancing schemes due to lenders' concerns about loan repayment capacity of rural borrowers and inadequate or no collateral.

Recommendation 14: The Bioenergy Association should use the on-going ILO/NBK biogas initiative in the Menya Governorate for demonstration of rural household biodigesters as productive assets and engage with commercial banks and micro-finance institutions for development of micro-credit schemes with low interest rates.

Lessons learned and best practices related to relevance, performance and success

The BSRD project was designed for demonstration of innovative technological, business and financial models for promotion of bioenergy in 4-5 Governorates of Egypt that were proposed based on the pre -feasibility studies and draft business plans conducted at the PPG stage of the project. In reality, the project was expanded to about 18 Governorates following Recommendation No. 2 of MTR of the project that advocated for extending the project activities beyond the originally proposed Governorates. The recommendation was based on expectation of higher demand for biogas units following interviews of a limited sample of rural beneficiaries in just one Governorate during visit of the MTR consultant.

A comprehensive analysis of geographical and socio-economic conditions in different Governorates would be more appropriate reasoning for a programme expansion rather than interview with a small sample of end users. Moreover, the recommendation apparently did not take into consideration other important factors, such as the political instability and lack of enabling policy frameworks for support of bioenergy development at that point in time and potential lack of business for established BSPs in some Governorates. A more appropriate recommendation would have been clustering activities in a small number of high potential areas with the aim to reach economies of scale for BSP companies.

On the contrary, the decision to change the focus of procurement of farm-level digesters from poultry to cattle farms was an example of good practice. This decision resulted from a critical

revision of the premises made at the pre-project stage on basis of biodigester feedstock composition required for optimal performance of the bio-digestion process.

Standardization and quality control are important for adoption and upscaling of the biogas technology. Although development of standards for biogas digesters was initiated early on, there are no tangible results of this work at the project closure. This is not good practice as lack of quality standards and insufficient quality control result in failure of biodigesters' operation.

One of the BSP companies initiated by the project recently sponsored establishment and work of a biodigester laboratory and biofertilizer plant at the Agricultural Department of the University of Menoufia. Such cooperation between a private sector company and academic institution is considered a good practice and should be therefore encouraged. The cooperation focuses the research work on high priority issues identified from the practical work of bioenergy service providers and therefore enables delivery of the research results to the field practitioners in the shortest way possible.

Although the current GEF policy allows a project to get maximum one extension, the BSRD project had been granted several extensions that ultimately led to more than double of the originally planned project implementation period. The initial extensions were justified on grounds of the political instability in 2011-2013 and proved to be beneficial as they enabled the project to achieve a majority of its planned results as of 2016.

Lack of progress with implementation of the financial mechanism prompted additional project extensions although after discussions with UNDP PTA/RTA it became obvious that this project component could not be implemented due to absence of administrative policies at UNDP for establishment and operation of the financial mechanism under the project. As the Government remained keen to implement the financial mechanism component, this caused disagreement about the final project extensions between the implementation and oversight functions of the Implementing Agency when the UNDP CO supported the ambition of the Government to extend the project while PTA/RTA recommended to close the project.

A lesson to be taken from this experience is that in case of insufficient supporting administrative policies and/or demonstrable lack of capacities to support implementation of certain components a project extension is imprudent as it creates false expectations on the side of the project beneficiaries and decreases overall efficiency of the project implementation.

Annex 1: Evaluation Terms of Reference

INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the Bioenergy for Sustainable Development Project (PIMS #2284)

The essentials of the project to be evaluated are as follows:

PROJECT SUMMARY TABLE

Project Title	**Bioenergy for Sustainable Development Project**			
		Financing	at endorsement (US$)	at completion US$)
GEF Project ID	1335	GEF	3,000,000	3,000,000
UNDP Project ID	2284	Private sector	250,000	
Atlas Award ID	00045899	Government	1,760,000	1,766,795.78
Atlas Output ID:	00054347	Other	150,000	150,000
Country	Egypt	Total co-financing		
Region	Arab States	Total project cost	5,160,000	4,916,795.78
Focal Area	E&E	ProDoc Signature (date project began)	20 November 2008	
FA Objectives (0P/SP)		(Operational) Closing Date	Proposed	Actual
Executing Agency	Ministry of State for Environmental Affairs Agency		2013	2019/2020
Other Partners Involved				

OBJECTIVE AND SCOPE

The project was designed to: facilitate and accelerate the market development for new bioenergy technologies (BET) in Egypt, thereby promoting sustainable socio-economic development of the rural communities in Egypt and reducing the negative global and local environmental impacts associated with the use of fossil fuels and the environmentally not sound management of the agricultural waste.

The objective of the project is to remove the technical, institutional, information, financial, and market barriers to developing the BET market in Egypt by (i) testing the feasibility and building the public confidence on BET systems and on the new business and financing models to facilitate their broader adoption, and on the basis of those models showing success, developing further the financial, institutional and market strategies for their large-scale replication;
(ii) supporting the development and adoption of an enabling policy framework to implement and leverage financing for the recommended strategies; iii) building the capacity of the supply side to do marketing, finance and deliver rural bioenergy services; and iv) institutionalizing the support provided by the project to facilitate sustainable growth of the market after the end of the project.

In order to facilitate sustainable market transformation, there is a need for parallel, mutually supportive measures that can create a sustainable demand through an enabling policy framework and other promotional measures, which are building the confidence of the market on the new technologies, and on the other side meeting this demand by building the capacity of commercially oriented and professional supply chain able to offer high quality products and services, combined with the access to affordable and sustainable financing mechanisms.

Through the implementation of the planned investments projects, the project is going to monitor and collect experiences from the different type and size of bioenergy applications, including family, community and farm scale, thereby exploring further the opportunities also for semi-industrial or industrial plants. For this purpose and in line with the recommendations coming out from the GEF Council review, more advanced technologies also from other countries will be evaluated in addition to the proposed lower costs technologies from China and India.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

EVALUATION APPROACH AND METHOD

An overall approach and method[1] for conducting project terminal evaluations of UNDP supported GEF financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact,** as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects. A set of questions covering each of these criteria have been drafted and are included with this TOR (*fill in Annex C*) The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders.

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

EVALUATION CRITERIA & RATINGS

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

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

Evaluation Ratings:

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

PROJECT FINANCE / COFINANCE

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

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

MAINSTREAMING

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

IMPACT

The evaluator will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements[2].

CONCLUSIONS, RECOMMENDATIONS & LESSONS

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

IMPLEMENTATION ARRANGEMENTS

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

EVALUATION TIMEFRAME

The total duration of the evaluation will be ***22*** days according to the following plan:

Activity	Timing	Completion Date
Preparation	4 days	*14 May 2020*
Draft Evaluation Report	*9* days	*1st week-July 2020*
Final Report	2 days	*End of July 2020*

EVALUATION DELIVERABLES

The evaluation team is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
Inception Report	Evaluator provides clarifications on timing and method	No later than *28 May 2020*	Evaluator submits to UNDP CO
Presentation	Initial Findings	*14 June 2020*	To project management, UNDP CO
Draft Final Report	Full report, (per annexed template) with annexes	Within 3 weeks of the evaluation assignment *1st week-July 2020*	Sent to CO, reviewed by RTA, PCU, GEF OFPs
Final Report*	Revised report	Within 1 week of receiving of receiving UNDP comments on draft *End of July 2020*	Sent to CO for uploading to UNDP ERC

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

TEAM COMPOSITION

The evaluation team will be composed of one international GEF focal [illegible] The consultant shall have prior experience of interest with project related activities.

[illegible] the project preparation and/or implementation and should not have a conflict

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

The Team members must present the following qualifications:

- Advanced university degree in a subject related to engineering, natural resources management, development or other relevant field;
- Minimum 8 years of relevant professional experience in the area of renewable energy, bio-energy technologies, rural energy, and energy policy
- Experience in environmental policy implementation and familiarity with climate change mitigation activities;
- Previous experience in evaluation for international development agencies, preferably for UN and/or GEF projects;
- Previous experience with results-based monitoring and evaluation methodologies;
- Familiarity with issues related to UNFCCC;
- Conceptual thinking and analytical skills;

- Excellent English communication skills; Strong writing and analytical skills coupled with experience in monitoring and evaluation techniques;
- Previous involvement in and understanding of UNDP and GEF procedures is an advantage and extensive international experience in the fields of project formulation, execution, and evaluation is an asset;
- Previous experience with gender-sensitive analysis.

EVALUATOR ETHICS

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

PAYMENT MODALITIES AND SPECIFICATIONS

(*this payment schedule is indicative, to be filled in by the CO and UNDP GEF Technical Adviser based on their standard procurement procedures)*

%	Milestone
10%	Acceptance of Inception Report
40%	Following submission and approval of the 1ST draft terminal evaluation report
50%	Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report

APPLICATION PROCESS

Applicants are requested to apply no later than ***23 April 2020.*** applications together with an updated P11 form for this position Procurement Unit, Procurementnotice.egypt@undp.org.

Individual consultants are invited to submit their either online (on UNDP website) or by email to the

The application should contain a current and complete **Personal History Form** (P11 form[3]) in English including the e- mail and phone contact, together with a **financial offer** including a lumpsum for the fees.

The Individual Consultants should provide a certificate of valid health insurance or show proof of valid health insurance. The insurance should cover the duration of the assignment. In case the consultant does not have a valid health insurance, s\he shall include health insurance fees in their financial offers and provide the certificate before signing the contract.

UNDP applies a fair and transparent selection process that will take into account the competencies/skills of the applicants as well as their financial proposals. Qualified women and members of social minorities are encouraged to apply.

Annex 2: Evaluation Matrix

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Relevance and Project Formulation			
Is the initiative aligned to the national development strategy? How does the project align with national strategies in the affected sectors and specific development challenges in the country? Where is this project implemented? Who are the main beneficiaries of the project and how does the project address their human development needs? To what extent are the objectives of the project still valid? Are the activities and outputs of the project consistent with attainment of its objectives?	Number of development and sectoral plans/strategies relevant for the project Level of alignment between the project objectives/outcomes and national development and sectoral strategies	UNDP programme/pro- ject documents UNDP programme/pro- ject Annual Work Plans Programmes/projects/ thematic areas evalua- tion reports Government's national planning documents Human Development Reports MDG progress reports Government partners progress reports Interviews with beneficiaries	Desk reviews of secondary data Interviews with government partners Interviews with NGOs partners/service providers Interviews with funding agencies and other UNCT Interview with civil societies in the concerned sector Interviews with related parliamentary committees Related Constitutional bodies such as Human Rights, Women Rights, etc. Field visits to selected projects
Were the project's objectives and components clear, practicable and feasible within its time frame? Were the capacities of the executing institution(s) and its counterparts properly considered in the project design? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and 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? Were the project assumptions and risks well identified in the PIF and the Project Document? To what extent has UNDP adopted participatory approaches in planning and delivery of the initiative and what has been feasible in the country context? What analysis was done in designing the project? Are the resources allocated sufficient to achieve the objectives of the project?	Level of participation of key and tangential stakeholders in the project design and implementation Level of stakeholder analysis at the project design stage Level of allocation of resources to individual outcomes Level of alignment with the priorities mentioned in the UNDAF and UNDP Country Programme Document Appreciation from national stakeholders with respect to adequacy of project design and implementation to national realities and existing capacities	UNDP staff Development partners (UN agencies, bilateral development agencies) Government partners involved in specific results/thematic areas Concerned civil society partners Concerned associations and federations National policies and strategies UNDAF and CPD documents	Interviews with UNDP staff, development part- ners and government partners, civil society partners, associations, and federations

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Project Implementation and Adaptive Management			
Did the project undergo significant changes as a result of MTR recommendations and/or of other review procedures? Did the changes materially change the expected project outcomes? Were there adequate provisions in the project design for consultation with stakeholder? To what extent were effective partnerships arrangements established for implementation of the project with relevant partners? To what extent were lessons from other relevant projects incorporated into project implementation? Whether feedback from M&E activities was used for adaptive management?	Response to the MTR Level of solution of implementation issues solved by PMU/UNDP Quality and level of use of implementation monitoring tools	Minutes of the Project Steering Committee meetings MTR Report Annual Work Plans Annual Progress Reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with UNDP staff Interviews with government partners Interviews with development partners Desk review of secondary data
– Was the M&E plan well conceived at the design phase and sufficient to track progress toward achieving objectives? Was the M&E plan sufficiently budgeted and funded during project preparation and implementation? Were the monitoring indicators from the project document effective for measuring progress and performance? Was the logical framework used during implementation as a management and M&E tool? What has been the level of compliance with the progress and financial reporting requirements/ schedule, including quality and timeliness of reports? What was the extent to which follow-up actions, and/ or adaptive management, were taken in response to monitoring reports (APR/PIRs)? .	M&E Plan design and implementation Quality and level of use of implementation monitoring tools Quality of existing information systems in place to identify emerging risks and other issues Quality of risk mitigations strategies developed and implemented Level of financial controls established and used to provide feedback on implementation Level of prioritization of activities for achievement of significant results Consistency of the APR/PIR self-evaluation ratings with the MTR findings	Minutes of the Inception Workshop Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with UNDP staff Interviews with government partners Interviews with development partners Desk review of secondary data

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Effectiveness			
Did the project or programme implementation contribute towards the stated outcomes? Did it at least set dynamic changes and processes that move towards the long-term outcomes? What outputs has the project achieved and what outcomes does the project intend to achieve? What changes and progress towards the outcomes can be observed as a result of the outputs? To what extent were the project objectives achieved? How does UNDP measure its progress towards expected results/outcomes? In addition to the project, what other factors may have affected the results? What were the unintended results (+ or -) of the project?	Target indicators in the project results framework Level of coherence between the project design and implementation approaches Level of coherence between activities and outputs/outcomes Level of management of assumptions and risks	Project/programme/thematic areas evaluation reports Data reported in project annual and quarterly reports by PMU and UNDP staff Development partners Government partners Beneficiaries	Interviews with UNDP staff Interviews with government partners Interviews with development partners Desk review of project annual and quarterly reports Field visits to selected sites
How broad are the outcomes (e.g., local community, district, regional, national)? What has been the results of the capacity building/training components of the project? Were qualified trainers available to conduct trainings? Are the results of the project intended to reach local community, district, regional or national level?	Level of outreach of the project to the ultimate beneficiaries Level of increase in capacity building resulting from the training components	Training evaluation reports Progress reports on projects	Desk review of secondary data
Who are the direct beneficiaries and how many of them were affected by the project? Who are the ultimate beneficiaries and to what extent have they been reached by the project? To what extent do the poor, indigenous groups, women, and other disadvantaged and marginalized groups benefit? How have the particular needs of disadvantaged groups been taken into account in the design and implementation, benefit sharing, monitoring and evaluation of the project/ programme? How far has the regional context been taken into consideration while selecting the project/ programme? Was there any partnership strategy in place for implementation of the project and if so how effective was it?	Level of outreach of the project to the ultimate beneficiaries Level of inclusion of marginal groups of beneficiaries Cooperation with partners on project implementation	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports MDG progress reports Human Development Reports	Desk review of secondary data

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Efficiency			
Has the project or programme been implemented within the original timeframe and budget? Have UNDP and its partners taken prompt actions to solve implementation issues, if any? Have there been time extensions on the project? What were the circumstances giving rise to the need for time extension? Has there been over-expenditure or under-expenditure on the project? What mechanisms does UNDP have in place to monitor implementation? Are these effective? Have there been any outside factors (e.g. political instability) affecting on implementation effectiveness?	Level of adherence to the original timeframe and budget Quality of annual workplans *vis-à-vis* the project logframe Level of solution of implementation issues solved by PMU/UNDP Quality and level of use of implementation monitoring tools Timeliness and adequacy of reporting provided Level of discrepancy between planned and utilized financial expenditures Comparison of planned vs. actual funds leveraged	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data
Were UNDP resources focused on the set of activities that were expected to produce significant results? Was there any identified synergy between UNDP initiatives that contributed to reducing costs while supporting results? Gas there been a Project Implementation Support Unit and how it assisted the efficiency of implementation? Were the project resources concentrated on the most important initiatives or were they scattered/spread thinly across initiatives? Did the leveraging of funds (co financing) happen as planned? Were financial resources utilized efficiently? Could financial resources have been used more efficiently? Was procurement carried out in a manner making efficient use of project resources? Was an appropriate balance struck between utilization of international expertise as well as local capacity? Did the project take into account local capacity in design and implementation of the project? Was there an effective collaboration between institutions responsible for implementing the project? How efficient are partnership arrangements for the project?	Synergies with similar activities funded from other sources Level of financial controls established and used to provide feedback on implementation Level of prioritization of activities for achievement of significant results Proportion of expertise utilized from international experts compared to national experts Number/quality of analyses done to assess local capacity potential and absorptive capacity Specific activities conducted to support the development of cooperative arrangements between partners, Examples of supported partnerships Evidence that particular partnerships/linkages will be sustained Types/quality of partnership cooperation methods utilized	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Sustainability			
Does/did the project have an exit strategy? How does UNDP propose to exit from projects that have run for several years? To what extent does the exit strategy take into account the following: – Political factors (support from national authorities) – Financial factors (available budgets) – Technical factors (skills and expertise needed) – Environmental factors (environmental sustainability) Were initiatives designed to have sustainable results given the identifiable risks?	Quality and level of self-sufficiency of institutional frameworks for continuation of activities after project completion Availability of counterpart/stakeholder funding for the project outcomes	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports	Desk review of secondary data
What issues emerged during implementation as a threat to sustainability? What corrective measures were adopted? How has UNDP addressed the challenge of building national capacity in the face of high turnover of government officials? What unanticipated sustainability threats emerged during implementation? What corrective measures did UNDP take?	Level and quality of identification of sustainability issues Nature and quality of corrective measures by the project management to address sustainability issues	Evaluation reports Progress reports UNDP programme staff	Interview with UNDP and PMU staff Desk review of secondary data
Do the various key stakeholders see that it is in their interest that project benefits continue to flow? Is there sufficient public/stakeholder awareness in support of the project's long-term objectives?	Level of stakeholder awareness and ownership of the project results		Interview with government representatives Interview with other stakeholders' representatives Desk review of secondary data
How has UNDP approached the scaling up of successful pilot initiatives and catalytic projects? Has the government taken on these initiatives? Have external donors stepped in to scale up and/or replicate the project activities? What actions have been taken to scale up the project if it is a pilot initiative?	Level of UNDP and government interest for scale-up and/or replication Level of external donor interest for scale-up and/or replication	Evaluation reports Progress reports UNDP and PMU staff	Interview with UNDP and PMU staff Review of external donor interventions Desk review of secondary data

Evaluation Questions	Indicators	Data Sources	Data Collection Methods
Progress towards impacts			
What difference has the project made to the direct and ultimate beneficiaries? Which are the intermediate states that lead to impacts, have they been achieved and how? Which (if any) are still missing gaps between the project outcomes and realization of the expected impacts? Are the necessary conditions in place for enabling scaling up of outcomes into impacts?	Level of coherence between the project outcomes and intended impacts Nature of conditions for conversion of outcomes into impacts	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data
Have there been verifiable improvement in energy intensity Have there been changes in specified indicators that progress is being made towards achievement of project objectives Have there been regulatory and policy changes at regional, national and/or local levels	Actual positive and negative, foreseen and unforeseen changes to and effects produced/induced by the development intervention	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data
Have indigenous institutions been established and or strengthened to provide leadership and technical support to the transfer of project outcomes into impacts? Have collaboration mechanisms between government agencies and their boundary partners established to implement the project-initiated measures? Have the relevant government agencies undertaken measures to support the adoption of the project's results and their inclusion as national priorities?	Level of key stakeholder awareness and ownership of the project results Quality and level of collaboration between the stakeholder institutions	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data
Are there sufficient fundraising, investment and revenue-generating mechanisms and strategies to enable and support the outcome-impact pathways? Are government agencies encouraged/enabled to facilitate wider adoption of the project results? Have senior and influential government officials endorsed the project's innovative approaches and champion the development of a more enabling policies, mechanisms and strategies for wider adoption?	Level of key stakeholders' awareness and ownership of the project results Level of stakeholders' financial commitments	Programme documents Annual Work Plans Annual Progress Reports Evaluation reports Government partners Development partners UNDP staff (Programme Implementation Support Unit)	Interviews with government partners and development partners Desk review of secondary data

SAMPLE QUESTIONS RELATING TO THE PROMOTION OF UN VALUES FROM A HUMAN DEVELOPMENT PERSPECTIVE			
Evaluation Questions	**Indicators**	**Data Sources**	**Data Collection Methods**
Supporting policy dialogue on human development issues			
To what extent did the initiative support the government in monitoring achievement of MDGs? What assistance has the initiative provided supported the government in promoting human development approach and monitoring MDGs? To what extent do the project objectives conform to agreed priorities in the UNDP country programme document (CPD) and UNDAF?	Level of contribution of the project to the achievement of MDGs Level of alignment of the project objectives with the CPD and UNDAF	Project documents Evaluation reports HDR reports MDG reports National Planning Commission Ministry of Finance	Interviews with government partners Desk review of secondary data
Contribution to gender equality			
To what extent was the UNDP initiative designed to appropriately incorporate in each outcome area contributions to attainment of gender equality? To what extent did UNDP support positive changes in terms of gender equality and were there any unintended effects? Provide example(s) of how the initiative contributes to gender equality. Can results of the programme be disaggregated by sex?	Level and quality of monitoring of gender related issues	Project documents Evaluation reports UNDP staff Government partners Beneficiaries	Interviews with UNDP staff and government partners Observations from field visits Desk review of secondary data
Addressing equity issues (social inclusion)			
How did the UNDP initiative take into account the plight and needs of vulnerable and disadvantaged to promote social equity, for example, women, youth, disabled persons? To what extent have indigenous peoples, women, conflict- displaced peoples, and other stakeholders been involved in pro-ject design? Provide example(s) of how the initiative takes into account the needs of vulnerable and dis- advantaged groups, for example, women, youth, disabled persons How has UNDP programmed social inclusion into the initiative?	Level and quality of monitoring of social inclusion related issues	Project documents Evaluation reports UNDP staff Government partners Beneficiaries	Interviews with UNDP staff and government partners Observations from field visits Desk review of secondary data

Annex 3: List of People Interviewed

Name	Position	Organization
Mohamed Bayoumi	Programme Specialist	UNDP CO Egypt
Amany Nakhla		UNDP CO Egypt
Marcel Alers	Global Head of Energy	UNDP BPPS
Lucas Black	Regional Technical Advisor – Energy (2014-2016)	UNDP BPPS
Saliou Toure	Regional Technical Advisor – Energy (2017 – present	UNDP BPPS (located in IRH)
Ahmed Medhat	BSRD Project Manager (2013 – 2016)	PMU
Hoda Omar	National GEF Coordinator	EEAA/Ministry of Environment
Ali Abu Sena	Executive Director	Bioenergy Association for Sustainable Development
Emad Eldin Adly	Head of the SGP Programme	SGP/GEF Egypt
Walid Darwish	Head of Environmental Department	MSMEDA
Samar Mesalam	Senior Specialist, Direct Lending Department	
Wael Abdelmoaz	National Consultant to Bioenergy Association	Professor of Environment & Energy
Amal Mowafy	Former ILO Programme Officer	ILO
Alshaimaa Omar	Bioenergy Service Provider	BioMix
Muhammad Omar	Bioenergy Service Provider	Biomasr

Annex 4: List of Documents Consulted

1. Bioenergy for Sustainable Rural Development: Project Document, UNDP/GEF 2008

2. Bioenergy for Sustainable Rural Development: Mid-Term Review Report, UNDP 2013

3. Bioenergy for Sustainable Rural Development: Management Response to MTR Recommendations, UNDP, 2013

4. Bioenergy for Sustainable Rural Development: Project Implementation Reviews (PIRs), UNDP, 2009 – 2019

5. Bioenergy for Sustainable Rural Development: Combined Delivery Reports, UNDP, 2009-2020

6. Bioenergy for Sustainable Rural Development: GEF Tracking Tool, UNDP 2013

7. BTOR and Note to File, Egypt, Lucas Black, 2015

8. Biogas Plant Construction Manual, SKG Singha, 2013

9. Biogas Plant Users Manual, SKG Singha, 2013

10. Education Manual, SKG Singha, 2014

11. Mission Report Summary, Egypt, Saliou Toure and Marcel Alers, 2018

12. Operational Programme 6 of the GEF-3 Period, GEF, 2008

13. Technical Support to the Ministry of Local Development in Support of Local Development: Project Document, UNDP, 2007

14. Technical Support to the Egypt Ministry of Local Development in Support of Local Development: Mid-Term Review Report, UNDP, 2011

15. Biennial Update Report for Egypt with the UNFCCC, Ministry of Environment, 2018

16. Egypt Cabinet of Ministers Decree No. 41 of 2019

17. Logical Framework for Household Biogas Units in Rural Egypt, Bioenergy Association, 2019

18. Gender Mainstreaming Policy Guidelines for Domestic Biogas and Improved Cook stoves programmes, HIVOS, 2013

19. Africa Biogas and Clean Cooking Conference: Conference Report, 2016

20. ILO/NBK Biogas Initiative in Minya, ILO, 2018

21. Rural Income and Economic Enhancement Project: Project Completion Report, African Development Bank, 2017

22. Results-based Financing for Energy Access, GIZ, 2018

23. National Biogas Programme, Ethiopia, Brief Programme Profile, SNV, 2007

Annex 5: Stakeholder Involvement Plan from the Project Document

Stakeholder	Envisaged Role in the Project
Government Institutions	
Ministry of State for Environmental Affairs / Egyptian Environmental Affairs Agency	Executing Agency Coordination of inputs and efforts among stakeholder
Ministry of Local Development	Responsible for the development of the rural communities
Ministry of International Co - operation	Support in leveraging other, international financing resources for supporting the project activities
Supreme Council of Energy	A key partner to discuss the energy pricing, possible incentives and the overall energy policy issues
Ministry of Finance, Ministry of Petroleum and Ministry of Energy	AS above
Rural Electrification Authority (REA)	Concerned with the extension of electricity from the main grid to rural areas
Egyptian Electric Utility and Consumer Protection Regulatory Agency	Responsible for studies on electricity prices and regulation of the construction of power project by private and other enterprises
New and Renewable Energy Authority (NREA), Ministry of Electricity	Responsible entity for promotion of using renewable energy resources at the national level, including a unit for bio-energy
Agricultural Research Center (ARC) and the Institute of of Soil, Water and Environment	Experience in biogas technologies in Egypt including an adapt ed design for Egyptian conditions
Specific Financing Entities	
National Bank of Egypt (NBE)	The largest Egyptian bank with extensive experience in managing soft credit lines for other international donors and development banks
Principal Bank for Development and Agricultural Credit (PBDAC)	Provides seasonal, investment loans and credits to the agricultural sector. It also finances private companies, agricultural cooperative societies, agents and distributors to ensure the availability of production inputs, including special credit schemes for rural women and young farmers
Social Fund for Development (SFD)	Autonomous governmental institution established to support Government's Economic Reform and Structural Adjustment Program A candidate to manage the BDF
NGOs	
Bassisa Community Development Society,	A non -governmental society with good experience in household biogas plants
Children and Development Society, Assuit	A non-governmental society with wide experience in community work and mobilizing people in rural areas for implementing development projects
The Coptic Evangelical Organization for Social Services (CEOSS),	A non -governmental society having experience in establishing household biogas plants in Minia and Beni Suef Governorates
International Centre for Environment and Development (ICED)	Experience in several projects on solid waste management
Other parallel projects	
Organization for the Reconstruction and Development of the Egyptian Village (ORDEV)	Implementing a comprehensive programme for rural development named as "El-Shorouk Programme" based on co-operation between the Government and the local rural communities
MISR Programme	A UNDP/Ministry of Planning initiative to support participatory planning and decentralization in the implementation of rural development activities Expected to provide the GEF Project with an established mechanism for participatory planning as the main venue for promoting BETs in rural Egypt within local communities
Joint UN Climate Change Risk Management Programme supported by the UNDP/Spanish MDG Achievement Fund	Through its Energy Policy Reform component and co -operation with the Supreme Energy Council, a main partner for promoting the establishment of a more conducive policy framework for bioenergy
International Research Institutions	
The Energy and Resources Institute in India (TERI)	To provide technical assistance, sharing experience and facilitating technology transfer
Private Commercial Sector and Public Media	Channel for public awareness raising and marketing activities

Annex 6: Project Results Framework (at the Project Inception)

Project Strategy	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
Objective of the project To remove the technical, institutional, information, financial, and market barriers to developing the bioenergy technology (BET) market in Egypt	The level of confidence on modern BET as means to contribute to rural energy needs. The market growth of BET The level of supportive framework conditions in place sustaining the market growth after the end of the GEF project.	Low level of confidence No market growth of BET Inadequate public support to the initiate and sustain the BET market growth	High level of confidence Average 20% market growth at the end of the project Supportive policy, including required financial and fiscal incentives in place to sustain the market growth.	Final project evaluation and the related stakeholder consultations.	The political will to effectively promote bioenergy as an alternative or complementary energy source to LPG, kerosine and diesel.
Outcome 1: New business and financing models successfully introduced using appropriate technical solutions and demonstrating the possibility to construct and operate BET systems on a cost recovery basis under a supportive and enabling policy and financing environment.	The level of confidence on modern BET and the implementation mechanisms promoted. The operational and financial data of the systems installed. The level of customer satisfaction.	Low level of awareness and confidence Only some family scale systems installed – lack of success stories on a broader scale.	The first pilot bioenergy systems constructed and operated by professional "Bioenergy Service Providers" on the basis of maximum cost recovery. At least 90% customer satisfaction on the new systems	Project reports Project midterm and final evaluation, including related surveys.	The targeted beneficiaries accept the proposed technologies, implementation and financing arrangements.
Output 1.1 An updated market analysis and finalized plans and operational criteria for the project's capacity building and financial support strategy.	Finalized, updated market analysis, plans and operational criteria for the project's capacity building and financial support strategy.	The market analysis plans and operational criteria for the project's capacity building and financial support strategy to be finalized.	See the indicator.	Project reports	Approval of the project by the GEF
Output 1.2 The Biomass Energy Support Fund (BESF) scheme successfully announced and launched.	Number of applications received and approved	No financial support facility or scheme exist to support BETs	The applications for support to reach the first year targets, i.e 50 family scale biogas plants and 2 community scale biogas plants received and approved.	Project reports	
Output 1.3 The BET systems installed as per the project annual and final targets.	Number of systems constructed.	No systems constructed	As per the stated project targets, at least 1000 family scale, 10-20 community scale, 2 farm scale biogas systems and, 2 gasification systems (supported by the Government of Egypt) and 1-3 additional biomass combustion or, as applicable, gasifications plants constructed and commissioned by the end of the project.	Project reports	See above

Output 1.4 A mid term and final monitoring and evaluation report of the systems constructed.	Report finalized	No monitoring	The results compiled, analyzed and disseminated.	Project reports	The output 1.3 successfully met
Outcome 2 An enabling policy framework, effectively promoting rural bioenergy development adopted.	The content of the policy actions, legal and regulatory changes adopted.	Subsidized fossil fuel and electricity prices. Lack of supportive policies to create a level playing field for BETs. Lack of adequate product standards and quality control mechanisms	An enabling policy framework for promoting sustainable rural biomass energy adopted, including: • Recognition of the BET and other renewable systems in official Gov't documents as the first option to be studied and considered for meeting rural energy needs, whenever technically and economically feasible • A level playing field for BET systems to compete with subsidized fossil fuels created and, as applicable, introduction of eventual additional financial or fiscal incentives to support BETs on the basis of their socio-economic and environmental benefits • A supportive regulatory framework for managing the relations between the bioenergy service providers and the customers; • Adoption of adequate product standards and quality control mechanisms.	Project reports and official Government documents	Consistency with the overall Government strategies and development priorities
Output 2.1 Enhanced awareness of and established policy dialogue with the key stakeholders and decision makers on the socio-economic benefits of BET systems.	The PR material produced The list and output of consultations held.	Inadequate attention on the socio-economic benefits of BET systems.	A project presentation package finalized Initial meetings and consultations with the key stakeholders and decision makers finalized within the first 6 months of the project. Enhanced awareness of the general public through programs and articles in public media, workshops etc.	Project reports	
Output 2.2 A draft policy paper highlighting the barriers and recommending improvements for the current policy framework for the	The status of the document	No comprehensive proposal on the steps to be taken for creating an enabling policy	The draft policy paper finalized.	Project reports	See above

promotion of rural bioenergy systems.		framework for biomass energy.			
Output 2.3 Continuing consultations, promotional events, high-level meetings and other measures to facilitate the adoption of the recommendations made.	The status and level of policy dialogue	Inadequate attention on the legal and regulatory changes needed to effectively promote BETs.	The required measures to facilitate the adoption of the recommended improvement of the BET policy environment finalized	Project reports	See above
Outcome 3 Enhanced capacity of the local supply chain to market and deliver sustainable rural bioenergy products and services, including financing.	The number of identified and trained "Bionergy Service Providers" (BSPs) capacitated to continue to operate on a self-sustaining basis after the end of the project. The level of follow-up activities of the trained BSPs.	Inadequate capacity of the supply chain to effectively market and deliver products and services for rural bioenergy development.	The capacity of at least 20 local entities to serve as BSPs built. The follow-up activities and business of the trained BSPs show an increasing trend, leveraging financing from a variety of sources.	Market surveys and monitoring reports Project mid-term and final evaluation	Adequate demand for rural bioenergy services can be created through the project. Interest of the targeted stakeholders to extend or expand their business in the bioenergy field.
Output 3.1 An updated survey and evaluation of the existing (or potential future) market players and their capacity to produce rural biomass energy related products and services.	The status of the survey.	No updated survey exists.	An updated survey and capacity evaluation finalized.	Project reports	
Output 3.2 Channels and opportunities for information exchange, networking, match making missions and conditions for different local and foreign entities to explore opportunities for co-operation created	Number of contacts facilitated	Good channels and opportunities for networking and matchmaking between the local supply side actors and potential foreign partners missing.	Project web site established including links to relevant information. At least one international, bioenergy workshop in Egypt and 5-10 matchmaking missions facilitated by the project.	Project reports	
Output 3.3 A manual for the development and financing of rural bioenergy projects in Egypt	The status of manual	No manual available	Finalized manual in Arabic and in English for developing and financing of rural bioenergy projects in Egypt.	Project reports	
Output 3.4 An information and marketing package tailored for the targeted co-financing sources to support the BSPs and related awareness raising / match making finalized	The availability of the information and marketing package. The number of meeting and financial matchmaking events organized	No consolidated information about BET systems to potential financing institutions available.	Information and marketing package about BET systems to potential financing institutions finalized. Contacts created between the BSPs and with at least 5 new promising co-financing sources in addition to the SFD	Project reports	See above
Output 3.5 Draft technical standards and certification system (to be adopted either as a voluntary	The status of the technical standards/ requirements and a certification system	No technical standards or certification system in place	Technical standards or requirements and a certification system developed and adopted (see outcome 2) both for hardware and for service providers in the distribution chain.	Project reports	-

or as a mandatory quality control scheme – see outcome 2).					
Output 3.6 Trained and, as applicable, certified product and service providers, including manufacturers, technicians etc.	Number and type of people trained Verified results of the training through a certification scheme	Lack of information and capacity in the supply chain to effectively market and deliver their products and services.	At least 100 people trained and, as applicable, certified from the supply chain in order to build up their technical, management and marketing, plant operation and maintenance and/or financial engineering skills (the scope of training depending on the target group)	Project reports	Interest and motivation of the targeted stakeholders for training can be created through perspective business opportunities, the introduction of the certification system or by other means.
Output 3.7 A joint public awareness raising and marketing campaign with supply side product or service providers for the targeted customers	The number of LoIs received	Lack of information to provide a basis for decision making	The number of LoIs received correspond to the targeted amount investments	Project reports	Interest of the targeted product and service providers to join the campaign.
Outcome 4 Institutionalization of the support provided by the project, including monitoring, learning, adaptive feedback and evaluation.	An entity continuing the bioenergy Market promotion after the project established and its funding secured The level of information available for Adaptive management,for measuring the impact and for effective replication/ expansion of the project activities.	Discontinuing support at the end of the project. Inadequate information for measuring the impact and for adaptive management.	An entity continuing the bioenergy market promotion after the project established and its funding secured Required information available during the implementation of the project for adaptive management, for measuring the impact and for effective replication/expansion of the project activities	Project final Evaluation Annual project reports	Successful completion of the prior project activities
Output 4.1 An updated baseline study, against which the impact of the project ca be measured.	Status of the report	Inadequate or outdated baseline information	Finalized, updated baseline study	Project reports	Selection of the right tools and methodologies for the baseline study and for monitoring project impact
Output 4.2 Project mid-term evaluation and other required reviews, including annual reports from continuing monitoring and evaluation of all the investment projects facilitatedby the project	Status of the reports	Inadequate information for adaptive management	Finalized mid-term evaluation and Adequate management response to address the MTE observations and recommendations	Project reports	Adequate monitoring, reporting and filing of the key documents to facilitate external reviews and evaluations
Output 4.3 Adding the topic of rural biomass energy increasingly into the curricula of the relevant academic and other educational institutions	The level of inclusion of bioenergy into the relevant curricula	Bioenergy inadequately covered by the current curriculas	Rural biomass energy increasingly included included into the curricula of the relevant academic and other Educational institutions	Project reports and final evaluation	See above
Output 4.4 A Biomass Energy Association or another applicable entity continue to serve as a focal point for further promotional activities on a self-sustaining basis	The existence and continuing Effective operation of a bioenergy focal point after the project	No focal point for rural bioenergy available after the project	A rural bioenergy focal point established and continue its effective operation also after the project	Final evaluation	See above
Output 4.5 As needed, further elaboration and financing leveraged for applicable financial support mechanisms to continue the promotion of bioenergy, including,	The continuing availability of the required financial support, when needed.	The existing Financing barriers continue to slow down the rural bioenergy development	Established financial support Mechanisms continue to attract financing for bioenergy projects at the end of the project as per the market development targets set at the	Final evaluation	See above

as applicable, carbon financing			project objective level		
Output 4.6 Final project report consolidating the results and lesson learnt from then implementation of the different project components and recommendations for the require next steps	Status of the final report	No consolidation of the results and lessons learnt	Final project report consolidating the results and lesson learnt from the implementation of the different project component and recommendations for the required next steps	Project reports and final evaluation	Continuing monitoring and reporting of the impact of the pilot projects by using the rights tools and methodologies as well as the experiences and lessons learnt during their implementation
Output 4.7 Final project evaluation	Status of the FE	No FE	Final evaluation finalized as per the specific UNDP and GEF requirements	Project reports	Adequate monitoring, reporting and filing of the key documents to facilitate external reviews and evaluations

Annex 7: Performance Rating of GEF Projects

The main dimensions of project performance on which ratings are provided in terminal evaluation are outcomes, sustainability, quality of monitoring and evaluation, quality of implementation, and quality of execution.

Outcome ratings

The overall ratings on the outcomes of the project will be based on performance of the criteria of relevance, effectiveness and efficiency. A six-point rating scale is used to assess overall outcomes.

Highly Satisfactory (HS)	Level of outcomes achieved clearly exceeds expectations and/or there were no short comings
Satisfactory (S)	Level of outcomes achieved was as expected and/or there were no or minor short comings
Moderately Satisfactory (MS)	Level of outcomes achieved more or less as expected and/or there were moderate short comings
Moderately Unsatisfactory (MU)	Level of outcomes achieved somewhat lower than expected and/or there were significant shortcomings
Unsatisfactory (U)	Level of outcomes achieved substantially lower than expected and/or there were major short comings
Highly Unsatisfactory (U)	Only a negligible level of outcomes achieved and/or there were severe short comings
Unable to Assess (UA)	The available information does not allow an assessment of the level of outcome achievements

Sustainability Ratings

The sustainability will be assessed taking into account the risks related to financial, sociopolitical, institutional, and environmental sustainability of project outcomes. The evaluator may also take other risks into account that may affect sustainability. The overall sustainability will be assessed using a four-point scale.

Likely (L)	There is little or no risks to sustainability
Moderately Likely (ML)	There are moderate risks to sustainability
Moderately Unlikely (MU)	There are significant risks to sustainability
Unlikely (U)	There are severe risks to sustainability
Unable to Assess (UA)	Unable to assess the expected incidence and magnitude of risks to sustainability

Monitoring and Evaluation Ratings

Quality of project M&E are assessed in terms of design and implementation on a six point scale:

Highly Satisfactory (HS)	There were no short comings and quality of M&E design / implementation exceeded expectations
Satisfactory (S)	There were no or minor short comings and quality of M&E design / implementation meets expectations
Moderately Satisfactory (MS)	There were some short comings and quality of M&E design/implementation more or less meets expectations
Moderately Unsatisfactory (MU)	There were significant shortcomings and quality of M&E design / implementation somewhat lower than expected
Unsatisfactory (U)	There were major short comings and quality of M&E design/implementation substantially lower than expected
Highly Unsatisfactory (U)	There were severe short comings in M&E design/ implementation
Unable to Assess (UA)	The available information does not allow an assessment of the quality of M&E design / implementation

Implementation and Execution Rating

Quality of implementation and of execution will be rated separately. Quality of implementation pertains to the role and responsibilities discharged by the GEF Agencies that have direct access to GEF resources. Quality of Execution pertains to the roles and responsibilities discharged by the country or regional counterparts that received GEF funds from the GEF Agencies and executed the funded activities on ground. The performance will be rated on a six-point scale.

Highly Satisfactory (HS)	There were no short comings and quality of implementation / execution exceeded expectations
Satisfactory (S)	There were no or minor short comings and quality of implementation / execution meets expectations
Moderately Satisfactory (MS)	There were some short comings and quality of implementation / execution more or less meets expectations
Moderately Unsatisfactory (MU)	There were significant shortcomings and quality of implementation / execution somewhat lower than expected
Unsatisfactory (U)	There were major short comings and quality of implementation / execution substantially lower than expected
Highly Unsatisfactory (U)	There were severe short comings in quality of implementation / execution
Unable to Assess (UA)	The available information does not allow an assessment of the quality of implementation / execution

Annex 8: Evaluation Report Outline

i. Opening page:

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

ii. Executive Summary

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

iii. Acronyms and Abbreviations

1. Introduction

- Purpose of the evaluation
- Scope & Methodology
- Structure of the evaluation report

2. Project description and development context

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

3. Findings

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

3.1 Project Design / Formulation

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

- Management arrangements

3.2 Project Implementation

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

3.3 Project Results

- Overall results (attainment of objectives) (*)
- Relevance (*)
- Effectiveness & Efficiency (*)
- Country ownership
- Mainstreaming
- Sustainability (*)
- Impact

4. Conclusions, Recommendations & Lessons

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

5. Annexes

- ToR
- Itinerary
- List of persons interviewed
- Summary of field visits
- List of documents reviewed
- Evaluation Question Matrix
- Questionnaire used and summary of results
- Evaluation Consultant Agreement Form

Annex 9: Evaluation Consultant Agreement Forms

Evaluators:

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

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

Name of Consultant: DALIBOR KYSELA

Name of Consultancy Organization (where relevant)**:** N.A.

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

Signed at Vienna on 30 May 2020

Signature: _____

Annex 10: Audit Trail – annexed as separate file