1. Project Data

Summary project data			
GEF project ID		4004	
GEF Agency project ID		100261	
GEF Replenishment Phase		GEF – 4	
Lead GEF Agency (include all for joint projects)		UNIDO – United Nations Industrial Development Organization	
Project name		Mini-grids based on small hydropower sources to augment rural electrification in Tanzania	
Country/Countries		Tanzania	
Region		Africa	
Focal area		Climate change	
Operational Program or Strategic Priorities/Objectives		GEF-4: Climate Change; Strategic programme CC-SP3 – promoting markets for renewable energy	
Executing agencies involved		Rural Energy Agency (REA), University of Dar es Salaam's College of Engineering and Technology (CoET) and the Ministry of Energy (MoE); Tanzania Electric Supply Company Limited (TANESCO)	
NGOs/CBOs involvement		none	
Private sector involvement		Andoya Hydro-Electric	
CEO Endorsement (FSP) /Approval date (MSP)		November 7th 2011	
Effectiveness date / project start		13 March 2012	
Expected date of project completion (at start)		13 March 2016	
Actual date of project completion		30 June 2018	
Project Financing[1][2][3]			
		At Endorsement (US $M)	**At Completion (US $M)**
Project Preparation Grant	GEF funding	0.06	0.06
	Co-financing	0.06	0.06
GEF Project Grant		3.35	3.35
Co-financing	IA own	0.08	0.08
	Government	7	7
	Other multi- /bi-laterals	0.1	0.1
	Private sector	2.5	2.5
	NGOs/CSOs		
Total GEF funding		3.41	3.41
Total Co-financing		9.74	9.74
Total project funding (GEF grant(s) + co-financing)		13.15	13.15
Terminal evaluation/review information			
TE completion date		March 2019	
Author of TE		Dr Drona Upadhyay and Ms Elizabeth Ngoye	

[1] TE, Table 8, p15
[2] TE, p30
[3] TE, p34-35

TER completion date	31 January 2020
TER prepared by	Mourad Shalaby
TER peer review by (if GEF IEO review)	Molly Watts Sohn

2. Summary of Project Ratings

Criteria	Final PIR	IA Terminal Evaluation	IA Evaluation Office Review	GEF IEO Review
Project Outcomes		S	-	S
Sustainability of Outcomes		ML	-	ML
M&E Design		S	-	S
M&E Implementation		S	-	S
Quality of Implementation		HS	-	HS
Quality of Execution		S	-	S
Quality of the Terminal Evaluation Report		--	-	S

3. Project Objectives

3.1 Global Environmental Objectives of the project:

The main objective of this project is to promote market-based approaches for developing mini/micro/small hydro power based mini-grids in order to increase the rural electrification rate and access to "modern and clean energy". The project will reduce greenhouse gases (GHG) emissions resulting from the use of traditional energy sources, such as diesel generators, in rural Tanzania.

The proposed micro / mini hydropower based mini-grids to be set up under the project are expected to bring about global environmental benefits by reducing 335,648 tons of CO2 directly and 2,685,185 tons of CO2 indirectly, which otherwise would have resulted from the use of diesel generators, as is currently the case in rural parts of Tanzania, where industries resort to diesel generators in the absence of grid electricity and households depend upon kerosene for lighting purpose and firewood for cooking purpose. This scenario is common in all the proposed project locations (4) which are spread out throughout the country. The energy supply situation in the country will also be improved remarkably.

3.2 Development Objectives of the project:

The main objective of the project is to promote micro/mini hydropower based mini grids in Tanzania to augment rural electrification, and thus to achieve a reduction of greenhouse gases (GHG) emissions related to the use of carbon intensive energy sources in rural areas of Tanzania.

The project has four key components (apart from a component related to project management) with outcomes related to each of the components:

Component 1: Techno-economic feasibility studies for the identified demonstration sites

Component 2: Capacity building of stakeholders in developing micro / mini hydropower based mini-grids

Component 3: Viable business model for micro / mini hydropower based mini-grid developed

Component 4: Demonstration of micro / mini hydropower plants

3.3 Were there any **changes** in the Global Environmental Objectives, Development Objectives, or other activities during implementation?

There were no documented changes in the objectives of the project nor in the implemented activities. A minor change noted in the TE was a change of National Project Coordinator (NPC) within the Project Management Unit (PMU) during the execution of the project, but "a handover was arranged to make a smooth transition from the outgoing NPC to the new NPC" (TE, p24).

4. GEF IEO assessment of Outcomes and Sustainability

Please refer to the GEF Terminal Evaluation Review Guidelines for detail on the criteria for ratings.

Relevance can receive either a Satisfactory or Unsatisfactory rating. For Effectiveness and Cost efficiency, a six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess. Sustainability ratings are assessed on a four-point scale: Likely=no or negligible risk; Moderately Likely=low risk; Moderately Unlikely=substantial risks; Unlikely=high risk. In assessing a Sustainability rating please note if, and to what degree, sustainability of project outcomes is threatened by financial, sociopolitical, institutional/governance, or environmental factors.

Please justify ratings in the space below each box.

4.1 **Relevance**	Rating: Satisfactory

The TE rates the project as "highly relevant", and this TER rates this project's relevance as satisfactory, given that it addresses a major development concern for Tanzania, namely the lack of rural electrification.

In the past years, Tanzania's electricity access rate has increased noticeably - from about 15% in 2010 to about 39% in 2016. While noticeable progress has been achieved in urban and peri-urban areas, the pace of rural electrification, currently at 7%, lags substantially behind the national average. Given the importance of electricity access for reducing extreme poverty for both urban and rural populations and fostering opportunities for productive economic activities, including agriculture, scaling up access to modern forms of energy is an important part of the Government of Tanzania's long-term economic growth plan. Said government is aiming to increase the country's overall electricity connectivity level to 50 percent by 2025 and to at least 75 percent by 2033. Its National Energy Policy, published in 2015, is the overarching policy framework for the energy sector in the country, and includes the development of domestic renewable energy and rural electrification as priorities for the country. The mission statement of the Energy Policy is "to provide reliable, affordable, safe, efficient and environment friendly modern energy services to all while ensuring effective participation of Tanzanians in the sector". By generating renewable electricity, supplying it to the mini-grid and involving local material and personnel, the project will improve the social and environmental objectives of the policy (TE, p14).

The Rural Energy Agency (REA), one of the executing agencies of this project, was created for the purpose of promoting and facilitating improved access to modern energy services in rural areas of mainland

Tanzania. REA became operational in October 2007. Tanzania possesses considerable and proven technical and environmental potential for generating power using small scale hydropower, particularly in the highland's headwater catchments. Wide development of micro / mini hydro power has not been realized, despite its potential, availability and the urgent demand for it.

The project is consistent with the GEF Climate Change focal area Strategic programme SP-3: Promoting market approaches for renewable energy. As described in the climate change focal area strategy, the proposed project will contribute positively to the renewable energy market transformation process, which will result in reduced fossil fuel use in the power sector and greenhouse gas (GHG) emissions reduction. The demonstration of viable and sustainable micro / mini hydropower projects will improve the policy and regulatory system, the GEF CEO endorsement document notes on page 23.

In addition, the project is also in alignment with and will contribute towards the Sustainable Development Goal on Energy (SDG 7), which aims to "ensure access to affordable, reliable, sustainable and modern energy for all" (TE, p14-15).

4.2 **Effectiveness**	Rating: Highly satisfactory

The TE rates the project's effectiveness as 'highly satisfactory', and this TER also rates effectiveness as highly satisfactory, as the project's four components were all implemented effectively and exceeded the desired impact, despite the fact that some hydropower installations are not operational yet, as explained under component four. (TE, p8-10).

Component 1: Techno-economic feasibility studies for the identified demonstration sites

Component one focused on pre-feasibility studies detailing site-specific information on potential micro / mini hydropower installations available for further development. These studies were carried out as planned and led to the continuation of the project under component two. There were eight planned demonstration schemes of reduced-size hydropower based mini-grids which were supported by UNIDO under this project. The TE notes that "Techno-economic or socio-environmental studies" have been produced for the sites identified at the formulation state of the project. These studies were carried out for the UNIDO supported projects of Kiliflora, Salala, Tandala, Madope, Lupali, Andoya (Mbangamao), Mpando and Ifumbo (Mbingu).

Component 2: Capacity building of stakeholders in developing micro / mini hydropower based mini-grids

Under this component, several training and capacity building activities were carried out. One of the key trainings was the turbine manufacturing training that took place in May 2014 in Bandung, Indonesia, attended by nine participants from different metal manufacturing institutions in Tanzania, including three

trainees from the country's Small Hydropower Centre (SHP Centre, see below) hosted within the College of Engineering & Technology (CoET) at the University of Dar es Salaam. The participants were trained on the fabrication of T-15 cross-flow turbines with a capacity of up to 150kW. The training also included licensing the participants rights to manufacture this type of Turbine in Tanzania, so they could develop a patent for replication and upscaling. As a direct result of this training, six turbines have been manufactured in Tanzania for installation across sites in the country (2 turbines of 5 kW each, two of 25 kW, one of 1 kW and one of 80kW) and one installed in Uganda.

A major output of this component, and of the project in general, has been the establishment of national micro / mini hydropower Technical Centre, the Small Hydropower (SHP) Centre, at the College of Engineering & Technology (CoET) of the University of Dar es Salaam, to provide technical support for various institutions in Tanzania. A number of students are benefiting from scholarships established under the project to pursue higher studies related to hydropower development. The TE notes that at the time of the evaluation (March 2019), the Small Hydropower (SHP) Centre was in the process of manufacturing a 75 kW turbine.

The outcome of this component was a reduced investment cost of micro / mini hydropower based mini-grids because of the local availability of technical experts and high-quality indigenous hydropower equipment.

Component 3: Viable business model for micro / mini hydropower based mini-grid developed

One of the planned outputs of this project was that existing financing options of the Rural Energy Agency (REA) be streamlined to benefit local entrepreneurs interested in micro / mini hydropower. REA has been very actively involved in this project and has provided significant funds to the demonstration of hydropower projects, specifically demonstrating the technical and economic viability of small hydropower technologies. The TE explains that "Evaluators believe that various business models are being prepared by UNIDO currently and are being finalized while this report is being prepared". The outcome of this component is an increased interest in micro / mini hydropower projects among local entrepreneurs.

Component 4: Demonstration of micro / mini hydropower plants

Four hydropower schemes are currently operating with the equipment procured through UNIDO support in various parts of Tanzania. There are four other hydropower schemes which are under various stages of development (TE, Table 3, p3). Generally, the schemes that are operating are delivering benefits to the local communities, the TE notes. Many of the operating demonstration schemes are not running at full capacity due to various reasons, including issues with distribution lines, grid connection and technical, financial and administrative hurdles. The planned total installed electrical capacity for the eight demonstration schemes was 3.2 Megawatts but the project is on course to achieve approximately 4.8 Megawatts of total power generation. The total of 4.8 MW generated will result in the avoidance of direct greenhouse gas (GHG) emissions of around 15,140 tons of CO2 equivalent per annum and just over 300,000 tons of CO2 equivalent over the lifetime of the demonstration projects.

4.3 **Efficiency**	Rating: Satisfactory

The TE rates the project's efficiency as 'moderately satisfactory', and this TER rates the project's efficiency as satisfactory, given that the project was cost-effective and GEF funding was able to leverage considerable funds, even though there were significant delays during project implementation.

One of the key aspects in measuring the efficiency of the project, the TE explains, is its cost effectiveness and its delivery "with the least costly alternative". In this context, the project was undertaken with "a good degree of efficiency" although the project time period was extended twice and delayed for a total of over two years. As the project was delayed, the timing of activities was not in line with the original plans, the TE explains.

The project is considered as cost-effective intervention for the GEF due to its CO2 emission reduction potential from the enhanced use of renewable energy for mini grid-based electrification in Tanzania, the TE reports. Currently, most of the individual electricity generation in Tanzania is small scale and diesel based. For a GEF contribution of US$ 3.35 million, this project directly resulted in 4.8 Megawatts of additional capacity based on micro / mini hydropower. More importantly, the project is expected to result in the replication of several such projects in Tanzania, thus making it a high impact GEF intervention with enormous potential for the promotion of renewable energy markets in Tanzania as well as in the region. The pilot and demonstration schemes that are part of this project will increase the local capacity in such a way that future interventions will be further cost effective. The project is expected to save cumulative GHG emission savings of 335,648 tons CO2 directly and 2,685,185 tons CO2 indirectly.

As shown in Table 8 of the TE, GEF support through UNIDO planned to leverage more than three times the amount funded through GEF. With a total budget of just over USD 13 million, 8 hydropower schemes will eventually be installed (four already installed and operational). The Rural Energy Agency (REA) has supported many of the hydropower schemes under the UNIDO project through their funding. However, it is not confirmed how much of the co-financing that was promised has been realized, the TE reports. In addition, the United Nation Capital Development Fund (UNCDF) also supported some of the installations through their financing schemes. These examples show that UNIDO support through GEF funding was able to efficiently leverage other considerable funding sources and tap into government funding through REA (TE, p14-15).

4.4 **Sustainability**	Rating: Moderately likely

The TE rates the project's overall sustainability as 'moderately likely', analyzing each of the four operations sites individually. This TER evaluated the project's overall sustainability using four dimensions (financial, environmental, sociopolitical and institutional). Based on this evaluation, this TER also rates the project's sustainability as moderately likely, given that there are some financials risks which are detailed below, but

that overall the project has generated strong stakeholder ownership due to the strong socioeconomic benefits generated.

Financial sustainability

The project focused significantly on the financial aspects of this project. Two of the four project components focused on economic feasibility, tariffs, and viable business models. Certain elements of the project indicate positive aspects in terms of financial sustainability, but there are also financial risks which need to be discussed.

The TE explains that increased electricity availability will encourage and foster productive activities, which will empower local people "enough to pay the electricity bills" and "increase the productivity of the industries which will ensure their repayment capacity for electricity bills".

The electricity generated from the project's micro / mini hydro power plants will be supplied to the local communities and other identified customers in each project site. The present demand of electricity outstrips the supply and hence there will not be any risk for "electricity offtake"-non-payment for the power output provided by an energy supplier- in the future, the TE explains. Incremental efforts were taken to establish a Feed-in-Tariff (FiT) scheme for micro / mini hydropower projects. The implementation of this scheme has made grid connected micro/mini hydropower projects more attractive for the project investors. Finally, the project streamlined 28 existing financing options from the Rural Energy Agency (REA) REA for hydropower projects, thus increasing the capacity of the local entrepreneurs to undertake micro / mini hydropower projects.

However, in some of the demonstration schemes, the revenue generated is not sufficient to cover the cost of operation of the schemes. This is due to low income levels among households, particularly in rural areas. There may be demand for electricity, but a lack of local purchasing power could hinder the financial viability of hydropower in and around the project sites. The project, and the Government of Tanzania, seem to have engaged in somewhat of a gamble: they are expecting the project's increased electrical supply to boost rural economies and growth, which in turn would generate revenue and finance the long-term operating cost of the hydropower installations. Furthermore, The Power Purchase Agreement (PPA) signed by Tanzania Electric Supply Company Limited (TANESCO) with a demonstration project is only valid for one year, leading to uncertainty and the risk of a potentially unfeasible tariff or the agreement not being renewed.

Sociopolitical sustainability

The project brought about considerable socio-economic benefits by improving access to electricity in four rural areas of Tanzania. This enhanced access led to industrialization and employment generation, especially through the micro / mini hydropower mini-grid demonstrations under component four. The project brought new technology, knowhow and technical capacity to Tanzania. The increased availability of power will continue to stimulate the growth of other industries near the project locations, as electricity is an essential and basic component of economic development. The direct and indirect employment generation will be an added economic benefit. The TE adds that that better electricity availability will

result in “productive activities […] increased so that the people will be empowered enough to pay the electricity bills. Moreover, the increased availability of electricity will in turn increase the productivity of the industries which will ensure their repayment capacity for electricity bills”.

In sum, the project’s contribution to the electrification of remote and poor rural areas in Tanzania positively impacted these rural economies and contributed to education through capacity building activities under component two. By increasing rural communities’ access to electricity, and stimulating rural economies, the project has addressed key social and political concerns in Tanzania. The project also addressed the barriers to commercialization of hydropower in the affected areas, increasing stakeholders ownership and confidence.

Institutional sustainability

The TE explains that for small scale renewable energy projects to succeed in any country, there needs to be a favorable policy framework that provides incentives to small scale off grid renewable energy projects, including hydropower schemes. Tanzania has “reasonable” policy frameworks in place to support small scale renewable energy systems. Feed-in-Tariff (FiT) are in place and certain of the project hydropower schemes are already selling electricity to Tanzania Electric Supply Company Limited (TANESCO).

The TE adds that the Rural Energy Agency (REA) is supportive of development of small-scale hydro power schemes in remote and rural areas. This is proven by the fact that many of the demonstration schemes have received cash and in-kind support from REA. This is important, as the REA operates under the Ministry of Energy of Tanzania. As such, its involvement in the project, through co-financing, the construction of various demonstration sites, the establishment of the national micro / mini hydro technical center and the streamlining of financing options for micro / mini hydro projects, is a testament to the continued interest and engagement of the government of Tanzania in the project. REA is expected to continue supporting the project’s hydropower schemes on behalf of the government, increasing the level of institutional sustainability.

However, even though there are favorable policies in place currently, entrepreneurs and developers of hydropower schemes have experienced hurdles in accessing government support and connection to the Tanzania Electric Supply Company Limited (TANESCO) grid has not always been easy, the TE notes, although it should be clarified that one scheme, as mentioned above, has connected to TANESCO and did not face any major hurdles in the connection process. Therefore, the TE puts forth other reasons for these hurdles in grid connection, such as a lack of prior information, awareness and communication about the connection procedures. Awareness regarding the Feed-in-Tariff (FiT) and grid connection requirements remains limited among developers of the hydropower schemes, the TE notes. Grid connection and the ability to sell any surplus energy is critical for sustainability and replication of small-scale renewable energy projects in Tanzania.

The government of Tanzania, through the Ministry of Energy and Tanzania Electric Supply Company Limited (TANESCO), is now revising its policies to expand a Feed-in-Tariff (FiT) for promoting renewable energy technologies, with the ultimate aim of having a national FiT that will create an attractive environment for private investors.

Finally, the TE explain that electricity access is a basic demand in Tanzania and is essential for its economic growth. So even if/when the government changes, there is little probability that the project's installations will not be maintained.

Environmental sustainability

The proposed micro / mini hydropower based mini-grids set up under the project are expected to bring about global benefits by reducing 335,648 tons of CO2 directly and 2,685,185 tons of CO2 indirectly, which otherwise would have resulted from the use of diesel generators, as is currently the case in Tanzania. Furthermore, industries usually resort to diesel generators in the absence of grid electricity and households depend on kerosene for lighting purpose and firewood for cooking purpose. This scenario is common in all the proposed project locations. Based on the above facts, it is expected that the project will positively impact the environmental sustainability of the affected sites, by improving air quality (indoors and outdoors), reducing CO2 emissions and mitigating climate change at a small scale, compared to the baseline.

In addition, this project has a replication potential of about 24 MW in other potential sites. If this potential is realized, there will be a considerable reduction in energy-related CO2 emissions in Tanzania, further enhancing the environmental sustainability of the project.

5. Processes and factors affecting attainment of project outcomes

5.1 Co-financing. To what extent was the reported co-financing essential to the achievement of GEF objectives? If there was a difference in the level of expected co-financing and actual co-financing, then what were the reasons for it? Did the extent of materialization of co-financing affect project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

Co-financing was essential to the achievement of GEF objectives to operationalize small hydropower installations and avert CO2 emissions, the main objectives of the project. According to the CEO endorsement document and the TE, there were no issues or differences in terms of materialization of co-financing. As explained previously, GEF support through UNIDO leveraged more than three times the amount funded through GEF. With a total budget of just over USD 13 million, 8 hydropower schemes will eventually be installed (four already installed and operational). The Rural Energy Agency (REA) has supported many of the hydropower schemes under the UNIDO project through their own funding and has contributed USD 7 million to the project, out of a total co-financing of USD 9.7 million, the rest of the funds being provided by the private sector and to a lesser extent the government and donors. In addition, the United Nation Capital Development Fund (UNCDF) has also supported some of the installations through their financing schemes. These examples show that UNIDO support through GEF funding has been able to leverage other considerable funding sources and tap into regular REA funds (TE, p14-15).

5.2 Project extensions and/or delays. If there were delays in project implementation and completion, then what were the reasons for it? Did the delay affect the project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

The project time period was extended twice. As the project was delayed, the timing of activities was not in line with the original plans. These delays were mostly centered around component four activities, namely the demonstration of micro / mini hydropower plants. The project's final project implementation report (PIR) explains that the development of three of the demonstration sites had been delayed due to financial constraints of the stakeholders.

5.3 Country ownership. Assess the extent to which country ownership has affected project outcomes and sustainability? Describe the ways in which it affected outcomes and sustainability, highlighting the causal links:

Country ownership was strong throughout the project, as hydropower development is very relevant to Tanzania's economic growth and rural development. Given the importance of electricity access for reducing poverty for both urban and rural populations, and for fostering opportunities for productive economic activities, including agriculture, providing access to modern forms of energy is a significant component of the Government of Tanzania's long-term economic growth plan and National Energy Policy.

Several of the Government of Tanzania's ministries and agencies were involved in this project, at various stages and levels of participation (TE, p13):

- The Vice President's Office – Division of Environment (VPO-DoE) acted as the GEF focal point and Chair of the Project Steering Committee (PSC).

- The Rural Energy Agency (REA), an autonomous body under the Ministry of Energy, constructed various demonstration sites; established the national micro / mini hydro technical center; and streamlined financing options for micro / mini hydro projects, in addition to its important financial contribution to the project.

- The Ministry of Energy (MoE) provided additional institutional support.

- The University of Dar es Salaam (UDSM)'s College of Engineering and Technology (CoET) provided staff support for the national micro / mini hydro technical center; prepared various training materials targeting different stakeholders; and built up human and institutional capacity in micro / mini hydropower by conducting suitable training.

- Finally, the Tanzania Electric Supply Company Limited (TANESCO) published the adapted guidelines for micro / mini hydropower installation and management.

The participation of several government agencies, ministries and offices is a testament to the strong country ownership of, and interest in, the project.

6. Assessment of project's Monitoring and Evaluation system

Ratings are assessed on a six point scale: Highly Satisfactory=no shortcomings in this M&E component; Satisfactory=minor shortcomings in this M&E component; Moderately Satisfactory=moderate shortcomings in this M&E component; Moderately Unsatisfactory=significant shortcomings in this M&E component; Unsatisfactory=major shortcomings in this M&E component; Highly Unsatisfactory=there were no project M&E systems.

Please justify ratings in the space below each box.

6.1 **M&E Design at entry**	Rating: Satisfactory

The TE rates the project's general monitoring and evaluation as 'satisfactory', and this TER also rates the project's M&E design as satisfactory, given that a detailed budget and significant information is provided in the Project Document (ProDoc) and CEO endorsement document.

The Project Document (ProDoc) provides significant attention to project Monitoring and Evaluation (M&E). A whole chapter is dedicated to the description of how the M&E of the project will be undertaken. The ProDoc provides a detailed logical framework and refers to the logframe as the basis for project evaluation as it provides the performance indicators for project implementation. The logframe describes in detail the outputs and outcomes of the project. The indicators and targets are well defined with sources of verification provided. The ProDoc also provides clear objectives for the M&E system which is "to ensure successful and quality implementation of the project." It aims to achieve this objective by:

i) tracking and reviewing the execution of project activities;
ii) taking early corrective action if performance deviates significantly from the original plans and
iii) adjusting and updating the project strategy and implementation plan to reflect possible changes on the ground results achieved and the corrective actions taken.

A separate budget item for the evaluation of the project has been allocated. Based on the above information, the M&E Design is satisfactory.

6.2 **M&E Implementation**	Rating: Satisfactory

The TE rates the project's general monitoring and evaluation as 'satisfactory', and this TER also rates the project's M&E implementation as satisfactory, given that this process was properly staffed and supervised, producing all the relevant expected reports and providing ratings on the progress of the project.

As the main implementing agency, UNIDO was responsible for the implementation of M&E of the activities and outputs during the execution of the project. The Project Management Unit (PMU) was the main responsible unit within UNIDO to monitor the progress of the project and produce regular monitoring

reports. As part of the monitoring, regular reports including monthly and annual reports were produced and copies of these reports were provided to the Evaluation team. The reports were found to be satisfactory in describing the latest status of the project and were a useful tool for monitoring progress, the TE reports.

Several visits to demonstration project sites were carried out by the Project Manager in Vienna and the National Project Coordinator (NPC) based in Dar es Salaam.

Annual Project Implementation Reports (PIR) were prepared and accompanied by several annexes related to the project outputs. The PIRs followed the logical framework and reported on progress achieved by components and outcomes categories. Ratings were also provided to evaluate this progress (TE, p23).

7. Assessment of project implementation and execution

Quality of Implementation includes the quality of project design, as well as the quality of supervision and assistance provided by implementing agency(s) to execution agencies throughout project implementation. Quality of Execution covers the effectiveness of the executing agency(s) in performing its roles and responsibilities. In both instances, the focus is upon factors that are largely within the control of the respective implementing and executing agency(s). A six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess.

Please justify ratings in the space below each box.

7.1 **Quality of Project Implementation**	Rating: Highly satisfactory

The TE rates the performance of UNIDO, the implementor of the project, as 'highly satisfactory'. This TER also rates the quality of project implementation as highly satisfactory, given that UNIDO fulfilled its responsibilities vis-à-vis the project and successfully leveraged significant co-financing amounts (TE, p24).

UNIDO acted as the GEF implementing agency for this project and had the main responsibility of implementing the project, including the delivery of activities and outputs. UNIDO also was expected to administer, manage and allocate the funds of the project on behalf of the GEF Secretariat.

The TE reports that UNIDO fulfilled its responsibility as defined in the project document "reasonably well", based on the literature review and on-field observations and interviews. UNIDO led the project, delivering most of the planned outputs and achieving the expected outcomes in collaboration with the concerned government ministries and private sector stakeholders. The key stakeholders of the project, such as the Rural Energy Agency (REA) and the Ministry of Energy, had clear responsibilities assigned by UNIDO. UNIDO set up a Project Management Unit (PMU), which was well-staffed, though there was a change of National Project Coordinator (NPC) during the execution of project, a handover was arranged to make a smooth transition from the outgoing NPC to the new NPC. The PMU, NPC and a Project Administrative Assistant (PAA) were based in UNIDO offices in Dar es Salaam. The PMU's function was mainly to

coordinate all the project activities carried out by the national experts and other partners, including day-to-day management and monitoring & evaluation of the project activities. A Project Steering Committee (PSC) consisting of all the major stakeholder organizations was established with the purpose of reviewing the progress in project implementation and guiding the project strategically in line with the country needs and priorities, among other responsibilities.

Examples of UNIDO's work during the project implementation included providing assistance in the procurement process for electro-mechanical equipment for the demonstration schemes (component four) and organizing and supporting several capacity building activities as part of the project (component two).

The United Nation Capital Development Fund (UNCDF) also supported some of the installations through their financing schemes. During interviews conducted by the evaluation team, UNCDF indicated that their participation would not have materialized had UNIDO support not been forthcoming. UNIDO support through GEF funding was able to leverage other funding sources and tap into government funds through the Rural Energy Agency (REA).

7.2 **Quality of Project Execution**	Rating: Satisfactory

The Rural Energy Agency (REA), University of Dar es Salaam's College of Engineering and Technology (CoET) and the Ministry of Energy (MoE) were the key national counterparts in this project. The TE rates the quality of project execution and the performance of national counterparts as 'satisfactory'. This TER also rates the quality of project execution as satisfactory as the three key executing agencies carried out their duties under their respective components, contributed to co-financing and collaborated productively with UNIDO, although they were also responsible for delays and project extensions (TE, p24-25).

REA had an important role to play, as it established and operationalized the Small Hydropower (SHP) Centre and provided support during the construction of various demonstration sites (component four). In addition, REA contributed significant co-financing funds to the project, USD 7 million out of a total co-financing amount of USD 9.7 million. In general, REA was involved in the project and provided support in the form of the construction of demonstration projects (component four), albeit with delays due to financial constraints.

The Ministry of Energy (MoE) is the umbrella public body on energy matters, including mini/micro hydro power. Given that the main objective of the UNIDO project was to promote micro / mini hydropower based mini grids in Tanzania, a target for the project was to work with the MoE to establish the Feed-in-Tariff (FiT) in the country for small scale hydro power projects, which sets "a fair and stable ground for the renewable energy (RE) technologies in relation to commercial aspects". During the course of the project, the FiT was established and implemented.

CoET was another key counterpart with the main responsibility to provide personnel and a venue to establish the SHP Centre. In addition, once the SHP Centre was established, CoET was to undertake capacity building and other activities under component two. The SHP Centre was established and provided a number of capacity building trainings for local developers and other personnel, and has established a workshop to manufacture crossflow turbines locally.

8. Assessment of Project Impacts

Note - In instances where information on any impact related topic is not provided in the terminal evaluations, the reviewer should indicate in the relevant sections below that this is indeed the case and identify the information gaps. When providing information on topics related to impact, please cite the page number of the terminal evaluation from where the information is sourced.

8.1 Environmental Change. Describe the changes in environmental stress and environmental status that occurred by the end of the project. Include both quantitative and qualitative changes documented, sources of information for these changes, and how project activities contributed to or hindered these changes. Also include how contextual factors have contributed to or hindered these changes.

The project reduced greenhouse gases (GHG) emissions resulting from the use of traditional energy sources, such as diesel generators, in rural Tanzania, contributing to better air quality and a mitigation of climate change.The proposed micro / mini hydropower based mini-grids set up by the project brought about global environmental benefits by reducing 335,648 tons of CO2 directly and 2,685,185 tons of CO2 indirectly, which otherwise would have resulted from the use of diesel generators, as is currently the case in rural parts of Tanzania, where industries resort to diesel generators in the absence of grid electricity and households depend upon kerosene for lighting purpose and firewood for cooking purpose. This scenario is common in all the proposed project locations (4) which are spread out throughout the country (PIR, p58).

8.2 Socioeconomic change. Describe any changes in human well-being (income, education, health, community relationships, etc.) that occurred by the end of the project. Include both quantitative and qualitative changes documented, sources of information for these changes, and how project activities contributed to or hindered these changes. Also include how contextual factors have contributed to or hindered these changes.

The project brought about considerable socio-economic benefits by improving access to electricity in four rural areas of Tanzania. This enhanced access led to industrialization and employment generation, especially through the micro / mini hydropower mini-grid demonstrations under component four. The project brought new technology, knowhow and technical capacity to Tanzania. The increased availability of power will continue to stimulate the growth of other industries near the project locations, as electricity is an essential and basic component of economic development. The direct and indirect employment generation will be an added economic benefit. The TE adds that better electricity availability will result in “productive activities […] increased so that the people will be empowered enough to pay the electricity

bills. Moreover, the increased availability of electricity will in turn increase the productivity of the industries which will ensure their repayment capacity for electricity bills" (TE, p12).

In sum, the project's contribution to the electrification of remote and poor rural areas in Tanzania positively impacted these rural economies and contributed to education through capacity building activities. These socioeconomic changes were not measured or quantified in the TE, but there is qualitative and anecdotal evidence that positive changes have already been experienced by the concerned communities.

8.3 Capacity and governance changes. Describe notable changes in capacities and governance that can lead to large-scale action (both mass and legislative) bringing about positive environmental change. "Capacities" include awareness, knowledge, skills, infrastructure, and environmental monitoring systems, among others. "Governance" refers to decision-making processes, structures and systems, including access to and use of information, and thus would include laws, administrative bodies, trust-building and conflict resolution processes, information-sharing systems, etc. Indicate how project activities contributed to/ hindered these changes, as well as how contextual factors have influenced these changes.

a) Capacities

Under the project's component two several training and capacity building activities were carried out. This resulted in furthering local availability of technical experts and reducing the investment cost of micro / mini hydropower based mini-grids (TE, p9).

- In May 2013, the project organized study tours for institutions and individuals to visit the Small Hydropower (SHP) center's manufacturing facilities and plants incorporating new technology outside the country. Groups of Tanzanian participants visited manufacturing facilities and small hydropower plants in Austria.
- In February 2014, a training for water basin authorities of small hydropower development was carried out, with a focus on incorporating hydrological data collection, resource mapping and analysis within their water jurisdictions. The training was conducted by the Small Hydropower (SHP) Centre.
- In September 2014, a training for practicing engineers on detailed design aspects of small hydropower was carried out. Participants from academic institutions and prospective practicing engineers attended the training.
- In February 2017, a training focused on the operation and maintenance of small hydropower plants was carried out. This training was designed to build capacity of operators of the demonstration of Small Hydropower (SHP) plants in the country in order to strengthen the operators' capacity on plant management, operation and maintenance as well as to make these sites sustainable.
- Between July and September 2017, an internship for the coordinator of the Small Hydropower (SHP) Centre in Tanzania at the International Center for Small Hydropower (ICSHP) in Hangzhou, China, was organized. The internship program is meant to help gain experience and understand operational procedures of the ICSHP with the eventual aim of strengthening the capacity of the Small Hydropower (SHP) Center in Tanzania.

- Between 2014 and 2016, scholarships were given to master's students pursuing graduate degrees in Renewable Energy specializing in Hydropower at the University of Dar es salaam.

In terms of hydropower capacity, four hydropower schemes are operating with the equipment procured through UNIDO support in various parts of Tanzania. There are four other hydropower schemes which are under various stages of development. Generally, the schemes that are operating are delivering benefits to the local communities. The planned total installed capacity for all eight demonstration schemes was 3.2 MW but the project is on course to achieve approximately 4.8 MW of total power generation. The total of 4.8 MW generated will result in the avoidance of direct greenhouse gas (GHG) emissions of around 15,140 tons of CO2 per annum and just over 300,000 tons of CO2 over the lifetime of the demonstration projects.

b) Governance

The project's impact on governance was mostly focused on removing institutional and economic barriers to the development of small hydropower installations. The project succeeded in fostering certain changes in the governance of renewable energy in Tanzania, notably in terms of tariffs and commercial aspects. The Tanzanian government has generally favorable policies to support small scale hydropower, but awareness regarding the Feed-in-Tariff (FiT) and grid connection requirements is limited among developers of the hydropower schemes. The project worked with the Ministry of Energy (MoE) to establish the Feed-in-Tariff (FiT) in the country for small scale hydro power projects, which sets "a fair and stable ground for the renewable energy (RE) technologies in relation to commercial aspects". During the course of the project, the FiT was established and implemented.

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8.4 Unintended impacts. Describe any impacts not targeted by the project, whether positive or negative, affecting either ecological or social aspects. Indicate the factors that contributed to these unintended impacts occurring.

There were no documented or mentioned unintended impacts of the project. The project did succeed in exceeding the planned total installed electrical capacity for its eight demonstration schemes, which initially was 3.2 Megawatts but is on course to achieve approximately 4.8 Megawatts of total power generation. In turn, a greater amount of CO2 emissions was also averted, as explained in previous pages.

8.5 Adoption of GEF initiatives at scale. Identify any initiatives (e.g. technologies, approaches, financing instruments, implementing bodies, legal frameworks, information systems) that have been mainstreamed, replicated and/or scaled up by government and other stakeholders by project end. Include the extent to which this broader adoption has taken place, e.g. if plans and resources have been established but no actual adoption has taken place, or if market change and large-scale environmental benefits have begun to occur. Indicate how project activities and other contextual factors contributed to these taking place. If broader adoption has not taken place as expected, indicate which factors (both project-related and contextual) have hindered this from happening.

The TE and CEO endorsement document explain that the various capacity building measures initiated under component two of the project, which included a training on licensing participants rights to manufacture turbines in Tanzania and developing a patent for replication and upscaling, and the creation of a favorable financing environment through the creation of viable business models under component three, result in a "high replication potential available for hydro resources". The project has a replication potential of about 24 MW in other potential sites, the TE indicates. If this potential is realized, then there will be a considerable reduction in energy-related CO2 emissions and improvements in the energy supply situation in Tanzania, especially in rural areas (TE, p73).

The project also strengthened and improved the policy and regulatory system for renewable energy, including micro / mini hydropower, by providing incremental support to the Feed-in-Tariff (FiT), the mechanism that regulates the commercial aspects of renewable energy in Tanzania. The project addressed the barriers to private sector participation in the micro / mini hydropower projects through various trainings and streamlining of available financing mechanisms. The project also transferred technology to interested micro / mini hydropower equipment fabricators to enable local fabrication. This increases the probability that similar projects will be replicated in other potential sites.

Therefore, the favorable conditions for hydropower development fostered by the project make it a "high impact GEF intervention with enormous potential for promoting renewable energy markets in the region as well as in the country". The pilot projects initiated under component four will increase the local capacity in such a way that the future interventions will be even more cost effective, thus further increasing chances for replication.

The Rural Energy Agency (REA) is supportive of development of small-scale hydro power schemes in remote and rural areas. This is proven by the fact that many of the demonstration schemes have received cash and in-kind support from REA. This is important, as the REA operates under the Ministry of Energy of Tanzania. As such, its involvement in the project, through co-financing, the construction of various demonstration sites, the establishment of the national micro / mini hydro technical center and the streamlining of financing options for micro / mini hydro projects, is a testament to the continued interest and engagement of the government of Tanzania in the project. REA is expected to continue supporting the project's hydropower schemes on behalf of the government, increasing the level of institutional sustainability.

However, even though there are favorable policies in place currently, entrepreneurs and developers of hydropower schemes have experienced hurdles in accessing government support and connection to the Tanzania Electric Supply Company Limited (TANESCO) grid has not always been easy, as explained previously. Awareness regarding the Feed-in-Tariff (FiT) and grid connection requirements remains limited among developers of the hydropower schemes. Grid connection and the ability to sell any surplus energy is critical for sustainability and replication of small-scale renewable energy projects in Tanzania.

9. Lessons and recommendations

9.1 Briefly describe the key lessons, good practices, or approaches mentioned in the terminal evaluation report that could have application for other GEF projects.

Some of the key conclusions from the evaluation are (TE, p26):

- The project has achieved significant results in terms of hydropower development in Tanzania even though there were some aspects of the project that could be improved. Many of the operating demonstration schemes are not running at full capacity due to various reasons – including issues with distribution lines and grid connection – both technical and administrative.
- The original plan was to install nine hydropower demonstration schemes with a cumulative capacity of 3.2 MW, but in reality, eight schemes at various stages of completion have been developed with accumulative capacity of 4,881 MW. Only four were operational at the time of the site visits by the evaluators though. An estimated 300,000 tons of CO2 equivalent greenhouse gas (GHG) emissions will have been reduced.
- UNIDO support through GEF funding has been crucial, leveraging other funding sources such as Rural Energy Authority (REA) and United Nations Capital Development Fund (UNCDF) funds.
- In some of the demonstration schemes, the revenue generated is not sufficient to cover the cost of operation of the schemes. This is due to low income levels among households, particularly in rural areas.
- The Power Purchase Agreement (PPA) signed by Tanzania Electric Supply Company Limited (TANESCO) with a demonstration project is only valid for one year, leading to uncertainty and the risk of a potentially unfeasible tariff or the agreement not being renewed.
- Although the project has helped women and children in a significant way, increasing access to power for rural households, and gender disaggregated data are being collected, gender issues were not considered in the design of the project.
- Even though the government has favorable policies to support small scale hydropower, awareness regarding the Feed-in-Tariff (FiT) and grid connection requirements is limited among developers of the hydropower schemes.
- Some demonstration schemes faced problems due to user manuals for turbine and generator not being supplied in English.
- Application and approval of water rights for development of hydropower is complex and time-consuming.

9.2 Briefly describe the recommendations given in the terminal evaluation.

The TE offers several recommendations for both the government of Tanzania and UNIDO (TE, p27):

- The Rural Energy Agency (REA), in collaboration with Tanzania Electricity Company Limited (TANESCO), should support the demonstration projects (component four) by extending the grid to more households and by connecting it to the local and national grid, thus achieving higher utilization rates.

- To improve the finances and sustainability of the small hydro demonstration schemes, productive uses of electricity should be promoted by government institutions such as the Rural Energy Agency (REA) and international agencies such as UNIDO in order to generate additional revenue from day-time use.
- Awareness of government policy and guidelines regarding Feed-in Tariff (FiT) and grid connection requirements among potential private developers of hydropower schemes should be improved by Tanzania Electricity Company Limited (TANESCO), the Ministry of Energy and the Rural Energy Agency (REA).
- Tanzania Electricity Company Limited (TANESCO) should ensure that the Power Purchase Agreements (PPAs) "are for longer duration to provide incentive and reduce risks to private hydropower developers".
- The government of Tanzania's relevant water authorities should simplify the water permit procedures.
- Hydropower developers and UNIDO should insist on user manuals to be provided in English as part of contractual terms and conditions.

10. Quality of the Terminal Evaluation Report

A six point rating scale is used for each sub-criteria and overall rating of the terminal evaluation report (Highly Satisfactory to Highly Unsatisfactory)

Criteria	**GEF IEO comments**	Rating
To what extent does the report contain an assessment of relevant outcomes and impacts of the project and the achievement of the objectives?	The report clearly outlines the impacts and outcomes of the project and details each hydropower scheme's progress, operation and capacity.	**S**
To what extent is the report internally consistent, the evidence presented complete and convincing, and ratings well substantiated?	The report is consistent in its findings and recommendations, although the ratings are somewhat inflated (see effectiveness) given the important delays faced by the project, and the fact that some hydropower installations are not running as planned.	**MS**
To what extent does the report properly assess project sustainability and/or project exit strategy?	The report focuses on the sustainability of each hydropower installation, and not by category (financial, institutional etc.). The information is adequate, although more information about sustainability had to be searched for in the rest of the report.	**MS**
To what extent are the lessons learned supported by the evidence presented and are they comprehensive?	The lessons learned capture the essence of the project, are supported by the evidence and are helpful for future GEF projects.	**S**
Does the report include the actual project costs (total and per activity) and actual co-financing used?	The report clearly outlines project costs by component, activity and source of financing.	**HS**
Assess the quality of the report's evaluation of project M&E systems:	The report's M&E design section is quite short, with no budget and little information. M&E implementation has better coverage in the report.	**MS**
Overall TE Rating		**S (4.6)**

11. Note any additional sources of information used in the preparation of the terminal evaluation report (excluding PIRs, TEs, and PADs).